POULTRY RESEARCH FOCUSED ON FEEDING MANKIND

UNITED STATES
DEPARTMENT
OF AGRICULTURE

AGRICULTURAL
RESEARCH
SERVICE

PREFACE

The information in this publication was compiled for distribution at the XV World's Poultry Congress and Exposition, New Orleans, LA, August 11-16, 1974. The purpose is to provide Congress attendees and others with current information concerning poultry research conducted by the Agricultural Research Service (ARS), U. S. Department of Agriculture, or supported by ARS in cooperation with other research institutions.

Information contained in this publication was obtained from the Current Research Information System which is administered by the Cooperative State Research Service. The objectives of each poultry research project are described, and the principal investigator, his location, and identifying number are given. The scope of the project can be determined by the number of Scientific Man-Years (SMY) allocated to the project. The date that the work was started is given, and the progress reports, if any, give a brief summary of research findings for the periods of time indicated.

The research projects are grouped into five broad categories, with some overlapping. These categories are:

August 1974

DISEASES AND PARASITES

INVESTIGATOR: NAZERIAN K 3309-11160-011

LOCATION: REGIONAL POULTRY RESEARCH LAB
EAST LANSING MICHIGAN

SMY: .4

START DATE: 22 02 72

REPLICATION OF THE HERPESVIRUS OF TURKEYS IN CHICKENS (ULTRASTRUCTURAL STUDIES)

OBJECTIVES:
Detetmine the site of replication of the herpesvirus of turkeys in inoculated chickens. Study the replication of Marek's disease virus in chickens already vaccinated with HVT. Determine the histological and pathological changes induced in Marek's disease in birds infected with HVT.

PROGRESS REPORT: 72/07 73/06
Replication of the herpesvirus of turkeys in chickens was studied by isolation of the virus from different tissues of vaccinated chickens and electron microscopy of the same tissues. Spleen, liver, thymus, blood, bursa, and skin preparations from vaccinated chickens were used at weekly intervals for a period of 8 weeks post vaccination. No difference was found between the replication of HVT and MDV except that the titer of the virus in each tissue was substantially lower than that in chickens infected with MDV. Electron microscopy showed no virus particles in any tissues of vaccinated chickens except in the feather follicles. During FY 1973 Dr. Nazerian will be on a special training assignment and located at the Karolinska Institute, Stockholm, Sweden. Although the primary purpose is to learn advanced techniques and principles under the guidance of Dr. George Klein, he will be investigating the cell surface antigens caused by Marek's disease virus and the herpesvirus of turkeys. Attempts to demonstrate a possible difference of membrane associated antigens (MA) between apathogenic HVT and pathogenic MDV will be undertaken.

INVESTIGATOR: WITTER R L 3309-11160-008

LOCATION: REGIONAL POULTRY RESEARCH LAB
EAST LANSING MICHIGAN

SMY: .5

START DATE: 27 01 71

PATHOGENICITY OF AVIAN HERPESVIRUSES (MDV AND HVT) FOR PRIMATES

OBJECTIVES:
To determine the pathogenicity of Marek's disease virus (MDV) and Herpesvirus of Turkeys (HVT) for subhuman primates and to survey selected human sera for antibody to MDV and HVT.

PROGRESS REPORT: 72/07 73/06
Possible human health hazards of Marek's disease virus (MDV) and turkey herpesvirus (HVT) were investigated by inoculating Marmoset, Cynomolgous, Bonnet and Rhesus monkeys. To date 79 inoculated monkeys have been observed for serologic, virologic and pathologic responses for over 1 year. All virologic and pathologic data have been negative, but 5 monkeys gave low titer reactions by immunofluorescence against MDV or HVT antigens. The specificity of these reactions could not be confirmed by precipitin or neutralization tests. Various attempts to grow these viruses in mammalian tissue cultures have been unsuccessful. No significant change in program direction is planned, although further effort on growth of MDV and HVT in mammalian cell cultures may be desirable. Goals for FY 1973 are to complete the above mentioned monkey evaluations. Also, sera from humans with various exposure to these viruses have been obtained and will be analyzed. A report by Sevoian that MDV and HVT grow in primary hamster kidney cells will be checked out.

INVESTIGATOR: SHARMA J M 3309-11160-010

LOCATION: REGIONAL POULTRY RESEARCH LAB SMY: .5
EAST LANSING MICHIGAN
START DATE: 22 07 71

STUDIES ON THE MECHANISM OF RESISTANCE OF LINE 6 CHICKENS TO MAREK'S DISEASE (MD)

OBJECTIVES:
Compare the response of resistant (Line 6) and susceptible (Line 7) chickens to Marek's disease virus (MDV) and study the mechanism through which the genetic resistance of Line 6 chickens is expressed.

PROGRESS REPORT: 72/07 73/06
Genetically resistant birds (Line 6) became infected with neurotropic and viscerotropic strains of Marek's disease virus (MDV) but demonstrated a marked resistance to clinical Marek's disease (MD). Since lesions of MD failed to develop in Line 6, "regression" of lesions was not the basis for genetic resistance. Doses of MDV approaching 10^6 times the dose required to induce neoplastic response in the susceptible Line 7 chickens failed to overcome the resistance of Line 6. This finding indicated that genetic selection may have promise for eventual eradication of MD. Differences in the neutralizing antibody response between Lines 6 and 7 suggested that genetic resistance may have immunologic basis. FY 1972 was spent in defining the response of genetically resistant chickens to Marek's disease virus. In FY 1973 mechanism of resistance will be studied. Studies are in progress to determine the role of virus neutralizing antibody in genetic resistance. Immunologic basis of resistance will be further examined by inoculating bursectomized and thymectomized birds of Line 6 with MDV. Physio-ogical factors involved in genetic resistance will also be studied.

INVESTIGATOR: NAZERIAN K 3309-11160-004

LOCATION: REGIONAL POULTRY RESEARCH LAB SMY: .5
EAST LANSING MICHIGAN
START DATE: 13 05 70

ETIOLOGICAL STUDIES OF MAREK'S DISEASE

OBJECTIVES:
Study the replication of Marek's disease virus (MDV) in resistant and susceptible chickens and produce high titers of the virus in cell culture for immunoprophylactic purposes, biochemical and antigenic studies of the virus.

PROGRESS REPORT: 72/07 73/06
Marek's disease virus causes the development of a new antigen on the surface of infected cells. However, as the virus becomes attenuated for chickens, it also loses the capacity to change the surface property of the infected cells. The 2 properties, the oncogenicity and change of the cell membrane antigens, may therefore be related. This surface antigen is common between 2 strains of the virus studies and indirect evidence suggests a similarity between this antigen and the envelope of the virus. A common capsid antigen is also found between MDV and the pseudovirus as examined by immunoferritin studies. During FY 1973 Dr. Nazerian will be on a special training assignment and located at the Karolinska Institute, Stockholm, Sweden. Although the primary purpose is to learn advanced techniques and principles under the guidance of Dr. George Klein, he will be investigating the cell surface antigens caused by Marek's disease virus and the herpesvirus of turkeys. Marek's disease virus will be grown in large scale in duck embryo fibroblasts in roller bottles and labeled with ^{3}H-Thymidine. The purified and extracted viral DNA is to be used for molecular hybridazation studies with tumor DNA or RNA.

INVESTIGATOR: LEE L F 3309-11160-006

LOCATION: REGIONAL POULTRY RESEARCH LAB SMY: .8
EAST LANSING MICHIGAN

START DATE: 19 06 70

STUDIES OF MAREK'S DISEASE VIRUS & RELATED CHANGES INDUCED BY VIRUS IN IN VITRO & IN VIVO SYSTEMS

OBJECTIVES:
Determine the biochemical composition of the Marek's disease virus, study the biochemical changes induced by the virus in infected cell culture, and demonstrate nucleic acid homology between viral DNA and tumor messenger RNA so as to investigate the possibility of viral genome integration in tumor cell genome.

PROGRESS REPORT: 72/07 73/06
Production of herpesvirus of turkeys in roller bottles in large-scale was further improved by adding primary chicken embryo fibroblasts to an already established monolayer of infected cells. This multilayer technique has increased yields per unit area greatly. A yield of 2.0 x 10^8 plaque forming units per roller bottles was obtained routinely. Marek's disease virus was also propagated in roller bottles and the extracellular viruses in the medium were concentrated and purified for the analysis of viral proteins by polyacrylamide gel electrophoresis. Results showed at least eight proteins. Protein 1 is the major viral capsid protein; II and IV are glycoproteins associated with viral envelope. The specific objective of this year's research is to study DNA synthesis in in vitro and in vivo. Induction of DNA synthesis is one of the important properties of oncogenic viruses. The mechanism of this induction will also be studied. Dayold chicks are to be inoculated with both oncogenic and non-oncogenic herpesviruses (MDV and HVT). Various organs (spleen, liver and gonads) and blood from infected and normal chickens will be studied in vitro using ^{3}H-Thymidine as a tracer. Extracts of these tissues will also be made for the study of the enzyme, DNA polymerase.

INVESTIGATOR: PURCHASE H G 3309-11160-009

LOCATION: REGIONAL POULTRY RESEARCH LAB SMY: .6
EAST LANSING MICHIGAN

START DATE: 25 05 71

THE MECHANISM OF IMMUNITY TO MAREK'S DISEASE (MD)

OBJECTIVES:
Determine the mechanism of immunity induced by the Herpes virus of turkeys (HVT) or attenuated MD virus (MDV-att) against MD and throw light on the pathogenisis of MD.

PROGRESS REPORT: 72/07 73/06
The delayed hypersensitivity and leucocyte migration inhibition tests have been applied to Marek's disease (MD) in chickens. Purified "A" antigen of MD would inhibit the migration of peripheral blood leucocytes from MD sensitized birds. The test is too time-consuming for further work. Studies on the ability of immune leucocytes to destroy MDV-infected cells, and the ability of stimulated leucocytes to synthesize virus have started. Additonal approaches will be made to the study of cellular immunity to MD. By by-passing the chickens' immune system by inoculating embryos, it is hoped that interferance between the herpesvirus of turkeys and Marek's disease virus can be examined.

INVESTIGATOR: WITTER R L 3309-11160-005

LOCATION: REGIONAL POULTRY RESEARCH LAB SMY: .5
EAST LANSING MICHIGAN
START DATE: 29 04 65

METHODS FOR ERADICATION OF MAREK'S DISEASE

OBJECTIVES:
Develop feasible methods for the eradication or control of Marek's disease; specifically through the principle of controlled environment housing.

PROGRESS REPORT: 72/07 73/06
Of the 5 additional attempts to rear chickens free of Marek's disease virus (MDV) for 20 weeks in filtered air positive pressure (FAPP) pens at Michigan State University, only 2 were successful. Older chickens (8-20 weeks) which were free of previous infection were markedly resistant to death and tumor induction compared to day-old chicks; no difference in susceptibility to virus infection was noted. Various commercial air filters were tested and those with dust spot ratings of 95% or greater were effective in removing infectious MDV from air. Due to the poor results of FAPP rearing experiments, the cooperative agreement with Michigan State University has been terminated. Goals for FY 1973 include the completion of ongoing FAPP rearing trials and the initiation of new work on age-related resistance, particularly to study the pathogenesis of MD in chickens of different ages.

INVESTIGATOR: STONE H A 29-001-211-23-084

LOCATION: MICHIGAN STATE UNIV SMY: .6
EAST LANSING MICHIGAN
START DATE: 17 04 68

GENETICS OF MAREK'S DISEASE

OBJECTIVES:
Determine the inheritance of Marek's disease; adapt in vitro assay systems to test genetic susceptibility status under laboratory conditions; compare in vitro assays to in vivo responses to determine if one reflects the other; and determine if Marek's disease genetics is related to genetically controlled physiologic traits.

PROGRESS REPORT: 71/07 72/06
Chickens of lines 6, 7 and their reciprocal F(1)'s were produced from flocks with and without Marek's disease (MD) virus and anitbody, either inoculated i.p. at one day of age or contact exposed, and reared on floor pens to 14 weeks of age. Bi-weekly bleedings were made to determine the levels of neutralizing antibody, agar gel precipitin (AGP) antibody and viremia. The results showed a generalized reduction in virus titer, AGP antibody, and mortality in the susceptible chickens from antibody positive parents when compared to chickens of antibody negative parents. Higher titers of neutralizing antibody in resistant chickens may be one mechanism whereby genetic control is expressed.

INVESTIGATOR: PURCHASE H G 29-001-211-23-128

LOCATION: REGIONAL POULTRY RESEARCH LAB SMY: .2
EAST LANSING MICHIGAN
START DATE: 25 05 71

THE PIGEON HERPES VIRUS (PHV) AS A VACCINE AGAINST MD

OBJECTIVES:
Confirm that PHV is non-pathogenic for chickens and determine whether it will

protect against MD. Determine the optimum procedures to use to vaccinate chickens.

PROGRESS REPORT: 70/01 72/11
Repeated experiments have shown no antigenic similarity between PHV and MDV. Although repeated experiments indicate some protection offered by PHV against MD, there is a question as to whether it is statistically significant. There is certainly not sufficient of a difference to use the PHV as a vaccine against MD. The pigeon virus does not protect against Marek's disease.

INVESTIGATOR: NAZERIAN K 29-001-211-23-075

LOCATION: REGIONAL POULTRY RESEARCH LAB
EAST LANSING MICHIGAN

SMY: .4

START DATE: 17 04 68

ULTRASTRUCTURAL STUDIES OF MAREK'S DISEASE (MD) TUMORS

OBJECTIVES:
Determine the ultrastructural characteristics of the tumors in MD, concentrating specifically on viral induced changes and presence of the virus and/or its components in infected cells.

PROGRESS REPORT: 71/07 72/06
Replication of MDV in chickens positive and negative for maternal antibody against the virus was examined in susceptible chickens. The titer of the virus in different tissues was studied by virus isolation from tissues. Same tissues were examined with the electron microscope. The titer of the virus in antibody negative chickens was always higher in most tissues than the similar tissues in antibody positive chickens and reached a high peak at two weeks post inoculation whereas this occurred two weeks later in antibody positive chickens. No major difference in the replication of the virus, as examined by the electron microscope, was observed between antibody positive and negative chickens.

INVESTIGATOR: WITTER R L 3309-11160-007

LOCATION: REGIONAL POULTRY RESEARCH LAB
EAST LANSING MICHIGAN

SMY: .8

START DATE: 01 09 70

EPIZOOTIOLOGY OF TURKEY HERPESVIRUS (HVT) IN TURKEYS

OBJECTIVES:
Determine the source of HVT infection and its manner of spread in commercial turkey flocks and determine the pathogenicity of the virus for turkeys.

PROGRESS REPORT: 72/07 73/06
Basic epizootiologic data on HVT infection in trukeys was obtained. Specifically, the virus was widespread among flocks and individuals, spread rapidly by contact from bird to bird, was not egg transmitted and produced no tumors or other lesions. Titers of cell-associated virus in blood were low (maximum 598 PFU/ml). Cell-free virus was recovered from skin and feather tips but not other tissues. A new virus resembling Marek's disease virus was isolated from turkeys and was pathogenic for both chicken and turkeys. Epizootiological investigations have been completed. The new turkey virus will be studied; however, further work will be performed under a new project after approval. It is planned to characterize the new turkey virus immunologically, in tissue culture and in pathogenicity tests so that its relation to Marek's disease virus and HVT can be determined. Field surveys for the new virus will be initiated.

INVESTIGATOR: LEE L F 3309-11160-001

LOCATION: REGIONAL POULTRY RESEARCH LAB SMY: .5
EAST LANSING MICHIGAN
START DATE: 12 04 73

RNA VIRUS GENOMES IN THE ETIOLOGY OF MAREK'S DISEASE

OBJECTIVES:
Study the role endogenous RNA virus genome plays in animal oncogenesis and the agents which switch on the genome from its normal repressed state, i.e., the investigation of RNA virus genome in the etiology of Marek's disease.

INVESTIGATOR: SHARMA J M 3309-11160-002

LOCATION: REGIONAL POULTRY RESEARCH LAB SMY: .5
EAST LANSING MICHIGAN
START DATE: 12 04 73

ISOLATION AND BIOLOGIC CHARACTERIZATION OF VARIANTS OF MAREK'S DISEASE VIRUS (MDV)

OBJECTIVES:
Separate and clone the various variants present in an isolate of MDV, and biologically characterize each clone and utilize CAM response as a biological marker for differenciating clones.

INVESTIGATOR: PURCHASE H G 3309-11160-012

LOCATION: REGIONAL POULTRY RESEARCH LAB SMY: .8
EAST LANSING MICHIGAN
START DATE: 09 05 72

THE IMMUNOPATHOGENESIS OF LYMPHOID LEUKOSIS

OBJECTIVES:
Delineate clearly the role of the bursa of Fabricius in tumor formation in chickens susceptible to lymphoid leukosis and in the prevention of tumor formation in chickens susceptible to leukosis sarcoma viruses but resistant to lymphoid leukosis. Determine the role of the immunologic system of the host in the progression and regression of tumors of lymphoid leukosis.

PROGRESS REPORT: 72/07 73/06
An excellent pig antiserum to the GS antigen of avian leukosis viruses has been prepared. It works well in cell culture. Standard stocks of about 15 leukosis viruses have been prepared and tested for purity. Antisera to the viruses have been stored. Some of the viruses are being submitted to the American Type Culture Collection. A number of the viruses have been tested for pathogenicity in chickens and RAV-1 was found to be the virus of choice for inducing a high incidence of lymphoid leukosis in line 15 x 7 chickens. Study of the pathogenesis of lymphoid leukosis will be commenced. Determination will be made as to whether cyclophosphamide treatment will eliminate lymphoid leukosis and whether transplantation with bursa cells will allow the chickens to succumb to lymphoid leukosis again.

INVESTIGATOR: SMITH E J 1106-11160-001

LOCATION: AGRICULTURAL RESEARCH CENTER SMY: .7
BELTSVILLE MARYLAND

START DATE: 27 08 69

BIOCHEMICAL BASIS FOR GENETIC RESISTANCE AND SUSCEPTIBILITY TO AVIAN LEUKOSIS-SARCOMA GROUP VIRUSES

OBJECTIVES:
Determine the chemical differences in the cell membranes of cells resistant or susceptible to leukosis-sarcoma viruses.

PROGRESS REPORT: 72/07 73/06
Since expression of virus information is controlled by host cell genes related to susceptibility to viruses of a specific subgroup, hamster antiserums to avian leukosis virus group specific antigens were prepared. This reagent was used to detect viral proteins in cell extracts from embryos of different matings using complement fixation tests. An assay for RAV-0 has been developed based on cocultivation with susceptible cells and subsequent detection also using complement fixation. Results indicated that subgroup B resistant cells from line 100 produced virus at levels which were hitherto undetected using reverse transcriptase. Endogenous Rous-associated virus (0) was purified and major structural proteins were separated by gel chromatography. Purified proteins will be used to prepare specific antiserums as additional probes in studying the genetics of host-cell control of viral information.

INVESTIGATOR: PURCHASE H G 3309-11160-013

LOCATION: REGIONAL POULTRY RESEARCH LAB SMY: .3
EAST LANSING MICHIGAN

START DATE: 09 05 72

PATHOGENICITY TESTS OF LEUKOSIS VIRUSES AND DEVELOPMENT OF A VACCINE

OBJECTIVES:
Develop a vaccine and to test various viruses which have morphologic, physical-chemical and immunologic properties in common with oncogenic viruses, determine whether they are in fact oncogenic.

PROGRESS REPORT: 72/07 73/06
Several different strains of lymphoid leukosis virus have been tested in chickens and have been found to vary greatly in their ability to induce different types of tumors. Testing of various untested isolates of leukosis viruses will continue. Emphasis will be placed on the testing of new field isolates for pathogenicity in the hope that some may be nonpathogenic and may act as vaccines.

INVESTIGATOR: STONE H A 29-001-211-23-039

LOCATION: MICHIGAN STATE UNIV SMY: .5
EAST LANSING MICHIGAN

START DATE: 17 04 68

DEVELOP AND MAINTAIN LYMPHOMATOSIS RESISTANCE AND SUSCEPTIBLE INBRED LINES OF CHICKENS

OBJECTIVES:
Develop and maintain inbred lines of chickens, some resistant, others

susceptible to avian lymphomatosis. Provide these lines to researchers for basic and applied studies of lymphomatosis and related neoplasms.

PROGRESS REPORT: 72/07 73/03
Populations of lines 100, 6, 7 and 15; their respective sublines; and crosses between lines 6, 7 and 15 were produced to maintain and improve established genetic traits. Genetic variability has been found for egg production, fertility, hatchability, livability, growth rate, egg weight, shell thickness, sexual maturity, skin maturation, histocompatibility and unilateral kidney development. Each area will be further investigated to determine the genetic factors involved. These populations will be available to supply chicks for studies of Marek's disease, lymphoid leukosis and other diversified interests of cooperating investigators throughout the next year. Selection will be applied to enhance the levels of resistance to specific diseases, egg production, reproduction, livability, and other traits thought desirable to the laboratory objectives and functions. This project will be terminated and replaced by an in-house service project.

INVESTIGATOR: BREESE S S JR 1502-11790-008

LOCATION: P O BOX 848 SMY: .0
GREENPORT LI NEW YORK
START DATE: 27 03 74

ELECTRON MICROSCOPY OF EXOTIC ANIMAL VIRUSES

OBJECTIVES:
Interaction of viruses with cells: their attachment, entry, morphogenesis, and release in the presence and absence of chemotherapeutic agents. Electron microscopic identification of new exotic animal viruses and more detailed characterization of previously visualized viruses. Examination of components release by chemical or physical methods.

INVESTIGATOR: BONEY W A 3202-11170-003

LOCATION: PO BOX 70 SMY: 1.1
AMES IOWA
START DATE: 28 03 73

CONTROL AND ERADICATION OF NEWCASTLE DISEASE OF POULTRY

OBJECTIVES:
Immunization of susceptible and passively immune turkeys and chickens against velogenic viscerotropic Newcastle Disease.

PROGRESS REPORT: 72/07 73/06
Progress has been reported under VSR a5-28.

INVESTIGATOR: BANKOWSKI R A 0703-11171-001-A

LOCATION: UNIV OF CALIFORNIA SMY: .0
DAVIS CALIFORNIA
START DATE: 15 05 73

CONTROL AND ERADICATION OF NEWCASTLE DISEASE OF POULTRY

OBJECTIVES:
Determine optimal methods of immunization of turkeys against specific strains of velogenic viscerotropic Newcastle disease virus (VVND).

INVESTIGATOR: HANSON R P 0707-11172-007-A

LOCATION: UNIV OF WISCONSIN SMY: .0
MADISON WISCONSIN
START DATE: 23 05 73

ADEQUACY OF VACCINES AGAINST VISCEROTROPIC NEWCASTLE DISEASE VIRUS

OBJECTIVES:
Evaluate the effectiveness of standard Newcastle disease vaccine strains against the new viscerotropic isolates.

INVESTIGATOR: KLEVEN S H 0707-11171-006-A

LOCATION: UNIV OF GEORGIA SMY: .0
ATHENS GEORGIA
START DATE: 24 05 73

VACCINATION OF BROILER CHICKS AGAINST NEWCASTLE DISEASE

OBJECTIVES:
Develop more effective methods of vaccination against viscerotropic velogenic Newcastle disease (VVND) in broiler chicks, and study the immune response to the vaccine.

INVESTIGATOR: HALL C F 0707-11173-008-A

LOCATION: TEXAS A & M UNIV SMY: .0
COLLEGE STATION TEXAS
START DATE: 23 05 73

CHARACTERIZATION AND CONTROL OF VISCEROTROPIC VELOGENIC NEWCASTLE DISEASE OF CHICKENS

OBJECTIVES:
Determine persistence of the Texas 219-1970 strain of viscerotropic Newcastle virus following exposure of chickens previously immunized with B(1), LaSota and Bankowski strains of virus.

INVESTIGATOR: BONEY W A VSRA5-28

LOCATION: P O BOX 70 SMY: 1.1
AMES IOWA
START DATE: 02 10 67

CONTROL AND ERADICATION OF NEWCASTLE DISEASE OF POULTRY

OBJECTIVES:
Successful immunization of 1-day-old susceptible and parentally immune chickens by vaccination with an inactivated Newcastle disease virus vaccine.

PROGRESS REPORT: 70/01 73/06
To improve or formulate new types of inactivated Newcastle Disease vaccines (NDV) more than 1,000 various combinations have been tested. Many of the vaccines immunized susceptible chickens. Only 2 vaccines immunized passively-immune chicks (and susceptible) satisfactorily, i.e., 1) BPL inactivated antigen/antibody complex vaccine with aluminum hydroxide gel and 2) BPL inactivated, alum precipitated-sodium hydroxide conjugated-formalin stabilized. Either of these vaccines when properly used stimulated protective

antibodies against virulent domestic and exotic Newcastle disease virus in passively immune (and susceptible) chickens and turkeys as well or better than available live virus vaccines. Other work demonstrated that oral administration of inactivated NDV vaccines in the drinking water, as well as intra-tracheal inoculation immunized susceptible chickens. A detailed histo-pathological study of exotic NDV in chickens and turkeys revealed it to be similar to domestic NDV. Turkey poults vaccinated with commercial B-1 and LaSota (lentogenic) live virus withstood exotic viscerotropic challenge exposure. Turkey hens vaccinated with commercial live B-1 virus (lentogenic) at 8 mos. and with killed virus at 11 mos. also survived similar challenge. None of the vaccines prevented light transient respiratory symptoms after challenge.

INVESTIGATOR: SCHLOER G 0707-11174-009-A

LOCATION: NEW YORK UNIV SMY: .0
NEW YORK NEW YORK
START DATE: 01 06 73

STUDIES ON THE VIRULENT VISCEROTROPIC NEWCASTLE DISEASE VIRUS

OBJECTIVES:
Determine the nature of the new exotic Newcastle disease virus (NDV) population, and its antigenic relationship to other virulent and vaccine strains of NDV.

INVESTIGATOR: GILLETTE K G 3202-11170-001

LOCATION: P O BOX 70 SMY: 2.0
AMES IOWA
START DATE: 18 04 73

INFECTIOUS BRONCHITIS OF POULTRY

OBJECTIVES:
Identify and characterize biologic, biochemical, immunologic, and serologic properties of various strains of infectious bronchitis virus with the goal of developing effective and practical methods for the diagnosis, prevention and control of the disease.

INVESTIGATOR: HEMPHILL F E VSRA5-23R

LOCATION: P O BOX 70 SMY: 1.1
AMES IOWA
START DATE: 11 07 69

INFECTIOUS BRONCHITIS OF POULTRY

OBJECTIVES:
Study the serological and biological characteristics of infectious bronchitis virus (IBV) and develop methods for its control and eventual eradication.

PROGRESS REPORT: 70/01 73/06
Neutralizing antibody in chickens exposed intratracheally to infectious bronchitis virus (IBV) correlated with increased serum levels of gamma, beta-2-, beta-1-globulins and total protein. IgG and IgM antibody were being synthesized by 7 days postexposure. IgM antibody declined after 14 days, but levels of IgG remained high during the 5-week experiment. Nine strains of IBV were adapted to growth and plaque formation in chicken embryo kidney cell cultures. Viral (plaque) assays were equivalent when done at 37 and 40 C, but plaque size of most strains was greater at 40 C. Plaque morphology was a constant and

identifying property for a strain or clone. Four strains (Iowa-33, Conn.-46, Iowa-609, SE-17) of IBV were inactivated with beta-propiolactone (BPL) and the vaccines given to susceptible chickens by subcutaneous injection. Over 80% of the chickens in each virus group had diagnostic levels of neutralizing antibody by 2 weeks after the second (0.5 ml) injection. Three strains (Mass., Iowa-97, Holte) failed to induce significant levels of antibody under similar conditions. Chickens given BPL-inactivated Conn. virus by aerosol (2 exposures 3 weeks apart) had diagnostic levels of cirulating antibody at 2 weeks following the second dose. The chickens were resistant to infection by an aerosol of the Mass. strain as determined by virus isolation studies. Chickens similarly treated with inactivated Iowa-33 and Iowa-609 failed to produce diagnostic levels of antibody and were not resistant to challenge.

INVESTIGATOR: PAGE L A 3202-11760-001

LOCATION: PO BOX 70 SMY: .2
AMES IOWA
START DATE: 28 03 73

ORNITHOSIS IN POULTRY

OBJECTIVES:
Develop, evaluate, and characterize an effective vaccine for the prevention of ornithosis in poultry.

INVESTIGATOR: PAGE L A VSRA5-20R

LOCATION: P O BOX 70 SMY: .5
AMES IOWA
START DATE: 02 10 67

ORNITHOSIS IN POULTRY

OBJECTIVES:
Develop methods and means for the identification, propagation, and characterization, of the different types of the etiologic agent of ornithosis.

PROGRESS REPORT: 70/01 73/06
Infectivity for experimental animals of chlamydiae isolated from diseased poultry was compared. Turkey and pigeon strains were distinguished from each other and from mammalian strains by their virulence for turkeys, pigeons, sparrows, parakeets, mice, and guinea pigs. Studies of both avian and mammalian strains resulted in a taxonomic proposal that strains of chlamydiae naturally affecting birds and mammals be classified into a single species, Chlamydia psittaci. Characterization of ornithosis-causing strains indicated that the optimal temperature for chlamydial multiplication in chicken embryos was 39 C. rather than 37 C., use of which reduced the time required for isolation of the organisms. Enzymatic capabilities of both strains were uninhibited at 44 C--the normal body temperature of pigeons and sparrows--although the turkey strain was more sensitive to 44 C. in vitro than was the pigeon strain. Serologic tests for chlamydial antibodies in turkeys, pigeons, and other animals were improved and simplified by application of double diffusion in gel (DDG) and capillary tube agglutination (CTA) methods. In tests of 2000 serums, the CTA test compared favorably with the complement-fixation (CF) test for sensitivity. Both the DDG and CTA methods were simpler than the CF method and were adaptable for use in small diagnostic laboratories. A procedure was developed for the rapid diagnosis of ornithosis in turkeys where the diseased airsacs were used as an antigen in a test against chlamydial antiserum. These results were embodied in chapters on chlamydiosis in 4 widely used texts.

INVESTIGATOR: HALL C F

0703-11771-001-A

LOCATION: TEXAS A & M UNIV
COLLEGE STATION TEXAS

SMY: .1

START DATE: 14 05 73

BLUECOMB DISEASE OF TURKEYS

OBJECTIVES:
Propagate the Coronavirus associated with Bluecomb in cell culture and reproduce the syndrome in turkeys. Prepare specific antiserum against this Corona virus for use in diagnostic serologic tests.

INVESTIGATOR: HALL C F

VSRA5-31B

LOCATION: TEXAS A & M UNIV
COLLEGE STATION TEXAS

SMY: .1

START DATE: 01 07 67

BLUECOMB DISEASE OF TURKEYS

OBJECTIVES:
Determine the intestinal microbial flora of turkeys affected with bluecomb disease and the agent or combination of agents which will consistently reproduce the disease syndrome in turkeys.

PROGRESS REPORT: 70/07 73/06
The agent of bluecomb was determined to be an RNA, membranous virus, probably of the Corona group. Electron micrographs of infectious and noninfectious filtrates have contained an assortment of such membranous agents; however, coronaviruses observed in infectious material have not been found in noninfectious material. Since such observations have been made numerous times, it is postulated that a coronavirus is the cause of bluecomb. Final confirmation awaits the success of propagating the agent in pure culture.

INVESTIGATOR: POMEROY B S

VSRA5-31A

LOCATION: UNIV OF MINNESOTA
ST PAUL MINNESOTA

SMY: 1.0

START DATE: 01 07 67

BLUECOMB DISEASE OF TURKEYS

OBJECTIVES:
Identify and characterize the causative agent of bluecomb disease of turkeys and establish a physiological basis for possible therapeutic and other preventative measures.

PROGRESS REPORT: 72/07 73/06
Length of bluecomb agent survival in various cell cultures was studied to obtain a suitable in vitro host system for its isolation. Bluecomb agent survival was shortest (24 hours) in chicken kidney (CK) cell culture. The survival was longest (120 hours) in turkey embryo intestinal (TEI) cell culture, which was unaffected by the state of cells (cells in suspension or in monolayers) or the temperature of incubation during sorption. Although the agent survived longest in TEI cells, there was apparent lack of multiplication in these cells, as evidenced by the decrease in the infectivity titer with increased time of incubation. The agent could be serially passed in these cell cultures only when passages were made at 5- and 7-hour intervals, which was indicative possibly of an extremely short replication cycle. The agent also survived in embryonating turkey eggs inoculated at 23 to 24 days of age with pathogenic bursal filtrates.

The poults hatched from the embryos had signs of bluecomb, and TEI and turkey embryo kidney (TEK) cell cultures prepared from the organs of the embryos were pathogenic to turkey poults, indicating survival of the agent through these steps. Possibly, the application of results of the present study and continued efforts to adapt the agent to turkey embryos and cell cultures will lead to in vitro isolation of bluecomb agent.

INVESTIGATOR: HANSON R P VSRA5-31C

LOCATION: UNIV OF WISCONSIN SMY: .0
MADISON WISCONSIN
START DATE: 01 07 67

INFLUENCE OF CLIMATOLOGICAL FACTORS IN BLUECOMB DISEASE OF TURKEYS

OBJECTIVES:
Conduct studies on the etiological agent(s) in turkey flocks clinically affected with bluecomb disease.

PROGRESS REPORT: 67/07 73/06
Bluecomb studies were concentrated in two areas, in vitro isolation of etiological agent and characterization of post-infection intestinal changes. Turkey cecal suspension of the Minnesota bluecomb agent was the infectious inoculum. Neither turkey kidney cells or turkey embryonic intestine explant cultures were suitable for propagating the infectious agent as was evident by the failure of culture fluids to transfer the disease producing property of the intestinal inoculum or to immunize poults against subsequent challenge. A 2 X 2 factorial design was utilized in studying intestinal changes. Two levels of infection and two levels of feeding were examined for affect at 3-day intervals from days 3 to 15 post-infection. Rate of gain although decreased by reduced feed was more severely decreased by infection. Feed conversion, plasma and jejunal alkaline phosphatase and xylose absorption were decreased by infection. Hematocrit was unaffected by the treatments. The biochemical changes are a partial explanation for the reduced functional capability of the infected intestinal tract.

INVESTIGATOR: WILLIAMS J E 7902-15980-003

LOCATION: USDA SE POULTRY RESEARCH LAB SMY: 1.0
ATHENS GEORGIA
START DATE: 05 07 67

SHELL PENETRATION, FUMIGANTS, AND SEROLOGICAL TESTS IN AVIAN SALMONELLOSIS

OBJECTIVES:
Characterize kinetics of shell penetration by salmonellae; develop methods of breaking salmonella transmission cycle by external shell treatments; and extend microantiglobulin blood tests for detection of carriers of all major salmonella groups.

PROGRESS REPORT: 72/07 73/06
Microantiglobulin test procedures for the serological detection of avian salmonella infections have been extended to the major sero-groups B, C, and D. Work is presently in progress on a microagglutination antigen for Group E, the last major sero-group infecting poultry. Strains for antigen preparation have been selected from many that have been screened. Stain intensity of antigens has been increased to its maximum by multiple additions of tetrazolium. Polyvalent antigens have been abandoned since they have not been found to offer the efficacy of monovalent antigens. In form variation studies of avian salmonella sero-group C cultures, it has been established that somatic antigen 6(1) is present in both C(1) and C(2) cultures in about the same amount;

however, antigen 6(2) varied in C(1) cultures and was essentially absent from C(2) cultures. Many improvements have been made in equipment manually used to conduct microtests for salmonella infections in poultry. Multiple dispensers have been adapted and made more accurate for conducting tests. A new method has been developed for collecting avian whole blood for serum in microtest plates, affording a means for multiple serum sample pick-up for a saving of time, expense, and effort in conducting microtest procedures.

INVESTIGATOR: SIONE H A 29-001-211-23-038

LOCATION: REGIONAL POULTRY RESEARCH LAB SMY: .5
EAST LANSING MICHIGAN
START DATE: 08 04 66

MAINTENANCE OF GENETIC LINES OF CHICKENS FREE OF LEUKOSIS, INFECTIOUS AND PARASITIC DISEASES

OBJECTIVES:
Provide continuous supply of specific lines or strains of chickens, chicks, and embryos free of leukosis, specific infections and parasitic diseases.

PROGRESS REPORT: 72/07 73/06
Generation "H", represented by approximately 360 adult chickens of lines 6, 7, 15, 151 and 100, was produced and maintained in strict isolation units. Eighteen week serology tests were incomplete, but early results indicate that the isolated stocks have remained negative for infection to Marek's disease, lymphoid leukosis and Salmonella pullorum. A poultry house was remodeled and converted to filtered air positive pressure (FAPP) to hold additional populations under disease free conditions. However, the first group of chickens reared under FAPP became contaminated with Marek's disease and was terminated. A lab review calls for termination of the project. This will be replaced by an in-house service project. The primary objective was the establishment and maintenance of a specific pathogen free (SPF) breeding flock representing the genetic lines at this laboratory to continuously supply chickens and embryos for research work. This encompasses the development, production and maintenance of an SPF flock.

INVESTIGATOR: SCHAR R D 1106-15980-001

LOCATION: AGRICULTURAL RESEARCH CENTER SMY: 1.2
BELTSVILLE MARYLAND
START DATE: 17 04 68

CONTROL OF HATCHERY-DISSEMINATED DISEASES

OBJECTIVES:
Identify sources of chicks, poults, waterfowl, and game birds which are produced by supervised breeding flocks and hatcheries and are relatively free from certain hatchery-disseminated diseases.

PROGRESS REPORT: 72/07 73/06
Approximately 90 percent of U.S. chicken hatcheries and 85 percent of the turkey hatcheries participated in the National Poultry Improvement Plan. In addition to the Chicks, poults, and hatching eggs sold to U.S. poultrymen, nearly 155 million units were sold to poultry men in 82 foreign countries. There was a 17 percent increase in the number of waterfowl and exhibition type hatcheries participating in the program. This reflects the move by the States to bring all hatcheries under supervision so they can qualify under the advanced methods of Plan participation. Two additional States attained this status during the past year, bringing the total to eight, and six more have indicated their desire to do so. The number of breeding chickens reacting to the pollorum-typhoid test

decreased by nearly 50 percent, to one each 568,000 breeders. No reactors were found in the turkey breeders. The rate of M. gallisepticum positive chicken flocks decreased from 10.1 to 1.8 percent, while reacting turkey flocks remained at about 0.3 percent. The percentage of turkey flocks reacting to the typhimurium test decreased slightly. Nearly 95 percent of the chicken breeding flocks and 90 percent of the turkey breeding flocks attained one of the breeding classifications.

INVESTIGATOR: ENGSTROM G W 3202-11820-002

LOCATION: PO BOX 70 SMY: .0
AMES IOWA
START DATE: 14 11 73

EFFECT OF TOXIC OR OTHER BACTERIAL, FUNGAL, OR VIRAL PRODUCTS ON ANIMALS AND CELLS

OBJECTIVES:
Study the effects of purified toxins or other biologically active products on the animal, at the cellular, subcellular, and molecular levels. Chemically characterize the purified compounds. Study possible correlations between structure and function.

INVESTIGATOR: BOOTHE A D 3202-11660-002

LOCATION: P O BOX 70 SMY: .4
AMES IOWA
START DATE: 16 05 72

HOST CELL REACTION TO PATHOGENIC MICROORGANISMS

OBJECTIVES:
Examine, describe and interpret reactions of cells infected with viruses, bacteria and fungi. Compare damage in cell cultures with damage in vivo.

INVESTIGATOR: KUBENA L F 29-002-211-25-085

LOCATION: MISSISSIPPI STATE UNIVERSITY SMY: .3
STATE COLLEGE MISSISSIPPI
START DATE: 17 04 68

THE EFFECT OF NUTRITIONAL FACTORS ON BROILER LOSSES CAUSED BY DISEASE

OBJECTIVES:
Determine the role of nutrition in broiler losses from infection.

PROGRESS REPORT: 68/04 73/04
Results were obtained which demonstrated that when broilers became infected with Gumboro disease, higher levels of amino acids were required for growth. The dietary energy requirement for growth was found to be the same irrespective of Mycoplasma gallisepticum infection.

INVESTIGATOR: KUBENA L F

7502-11170-002

LOCATION: SO CENTRAL POULTRY RESEARCH LA
STATE COLLEGE MISSISSIPPI

SMY: .0

START DATE: 13 03 74

POULTRY NUTRITION-DISEASE INTERACTIONS

OBJECTIVES:
Determine the nature of poultry nutrition-disease interactions.

INVESTIGATOR: PATTERSON W C

7902-11170-005

LOCATION: USDA SE POULTRY RESEARCH LAB
ATHENS GEORGIA

SMY: 5.0

START DATE: 26 07 72

DISEASE-ENVIRONMENT INTERACTION IN POULTRY AS RELATED TO CONDEMNATIONS

OBJECTIVES:
Evaluate the pathology and spreading potential of respiratory diseases of poultry in controlled environments. Reduce or eliminate disease using modified environmental control procedures.

PROGRESS REPORT: 72/07 73/06
Studies on the effects of environment on broilers reared in cages and on litter floors continued. Low temperature depressed growth in feed efficiency more severely in caged broilers than in floor-reared broilers.

INVESTIGATOR: CYSEWSKI S J

3202-11820-003

LOCATION: P O BOX 70
AMES IOWA

SMY: 4.9

START DATE: 12 06 65

THE EFFECTS OF MYCOTOXINS ON ANIMALS

OBJECTIVES:
Study the biological effects of mycotoxins on domesticated animals. Correlate the clinical, clinical pathological and histopathological changes following the administration of mycotoxin to selected animal species. Develop criteria for the diagnosis and treatment of specific intoxications.

PROGRESS REPORT: 71/07 72/06
The manifestation of acquired resistance was impaired in turkey poults vaccinated against Pasteurella multocida infection while receiving a ration containing aflatoxin (0.25 to 0.5 ppm B(1) activity). Passive transfer of plasma from immune birds or from normal birds supplemented acquired resistance to a point where the recipients survived challenge exposure; passive transfer of cells from immune birds did not supplement resistance. Ratios of organ weight to body weight and histopathologic appearance demonstrated thymal involution in recipients of aflatoxin. Guinea pigs were dosed once daily with partially purified aflatoxin for 20 days. A significant depression of average complement titers occurred in guinea pigs given a daily dose of aflatoxin equivalent to 0.03 mg or greater of aflatoxin B(1). The average body weight of guinea pigs given a daily dose of 0.015 mg or more aflatoxin B(1) was significantly below that of control guinea pigs. Considerable individual variation in complement titers, weights and liver changes were noted.

INVESTIGATOR: YODER H W JR 7902-11170-003

LOCATION: USDA SE POULTRY RESEARCH LAB SMY: 1.3
ATHENS GEORGIA
START DATE: 26 07 72

MYCOPLASMA INFECTIONS IN POULTRY RELATED TO CONDEMNATIONS

OBJECTIVES:
Determine pathogenesis of Mycoplasma synoviae respiratory infections, study problem of M. gallisepticum agglutination reactors in previously negative flocks, and evaluate newer serological tests for identification of mycoplasma infections.

PROGRESS REPORT: 72/07 73/06
Studies with recent isolates of M. synoviae from broiler flocks with airsacculitis problems continued. Aerosol application of such cultures 5 days after young chickens were contact-exposed to infectious bronchitis virus produced moderate to severe airsacculitis in 25-60% of the chickens. Results were variable, but tended to be closely related to relative humidity and/or ventilation rates. Ammonia concentrations were increased at the lower ventilation rates in the small cages, but not always at higher humidity levels in the larger environmental cabinets. Serologic evaluations pointed out difficulties in establishing the significance of some chicken sera with agglutination reactions to M. gallisepticum (MG) plate antigen, but with negative to low HI titers. Preliminary results with the antiglobulin test were not encouraging. Investigation of the agar gel precipitin test has been initiated and is being studied as a possible aid in the serotyping of avian mycoplasma cultures where the fluorescent antibody procedure has proved to be somewhat variable.

INVESTIGATOR: VARDAMAN T H 7502-11170-001

LOCATION: MISSISSIPPI STATE UNIVERSITY SMY: .7
STATE COLLEGE MISSISSIPPI
START DATE: 13 06 67

MYCOPLASMA INFECTIONS IN CHICKENS IN MODIFIED ENVIRONMENTS

OBJECTIVES:
Develop standard antigens for avian mycoplasma testing by selecting appropriate Mycoplasma cultures; study pathogenicity and serology of Mycoplasma gallisepticum in chickens in changing environments.

PROGRESS REPORT: 72/07 73/06
To determine if Mycoplasma synoviae causes broiler condemnation due to airsacculitis, results were obtained that showed Mycoplasma synoviae plus a viral stress will cause extremely high levels (40%+) of broiler condemnation due to airsacculitis. To determine if microwave radiation can be used to satisfactorily inactivate the Mycoplasma organism in hatching eggs, preliminary results obtained showed that eggs weighing from 57 to 72 grams heated by microwave radiation to a temperature of 128° F. decreased hatchability by 1.0 to 10.0%. To determine the role of the bursa of Fabricius in the immune response to Mycoplasma synoviae, results obtained showed that the bursa of Fabricius is the immunologic tissue involved in the immune response of the bird to Mycoplasma synoviae.

INVESTIGATOR: RHOADES K R 3202-11170-005

LOCATION: P O BOX 70 SMY: 1.1
AMES IOWA
START DATE: 26 04 67

TURKEY AIRSACCULITIS

OBJECTIVES:
Identify and characterize the infectious organisms involved in turkey respiratory diseases, with particular emphasis on Mycoplasmata. Study the pathogenesis of infections produced by these agents, the mode of transmission, and methods of elimination.

PROGRESS REPORT: 72/07 73/06
Microbiological examination of yolk material from 25 dead-in-shell turkey embryos and 25 cull 1-day-old poults resulted in the isolation of carbohydrate nonfermenting bacteria from 5 embryos and 1 poult. Many of the biochemical characteristics of these isolates were similar to those from Mima polymorpha variety oxidans. Other research workers have described the isolation of bacteria with characteristics of M. polymorpha from turkey poults with respiratory disease. Recovery of these bacteria from turkey embryo yolk suggests that they may be egg-transmitted.

INVESTIGATOR: POMEROY B S VSRA5-21RA

LOCATION: UNIVERSITY FARM SMY: .4
ST PAUL MINNESOTA
START DATE: 02 10 67

AIRSACCULITIS OF TURKEYS ASSOCIATED WITH CONDEMNATIONS

OBJECTIVES:
Determine the heterocyclic capacities of the pathogenic strain of Mycoplasma gallisepticum; investigate the significance of other pathogens in the airsacculitis syndrome such as chicken embryo lethal virus, Pasteurella, ornithosis, N. strain of M. gallisepticum (M. meleagridis) and Escherichia coli.

PROGRESS REPORT: 67/10 73/10
Epidemiological investigations of respiratory infections in turkeys indicated a wide variety of etiological agents were involved in condemnations associated with airsacculitis. Egg transmitted mycoplasma infections (Mycoplasma gallisepticum, MG; Mycoplasma meleagridis, MM; and Mycoplasma synoviae, MS) have received most attention. MG control program has reduced the incidence of the disease in turkeys to low level in market turkeys. Occasional breaks in market and breeder flocks resulted from contact with MG infected chicken flocks. MM infection continues to be widely disseminated. Egg dipping program has been effective in reducing the incidence of air sac lesions but clean populations of commercial breeder flocks have not resulted. Antibiotic treatment of semen to reduce MM infection has been only partially successful. Serological and bacteriological procedures have been developed to identify MM free populations. MS has been encountered in market and breeder flocks. Prevalence of MS in turkeys has not been determined. Standardization of serological tests is still under investigation. Egg-egg-transmitted infections have been related to high condemnations. Avian influenza periodically becomes widely disseminated causing high condemnations in market turkeys and depression of egg production. An agar diffusion precipitin (AGP) test has been highly effective in establishing the presence of infection. Reservoirs of avian influenza are under investigation. Pasteurellosis is a constant problem and occasionally is associated with high air sac condemnations.

INVESTIGATOR: POMEROY B S 3202-11170-004A

LOCATION: UNIV OF MINNESOTA SMY: 1.1
ST PAUL MINNESOTA
START DATE: 28 03 73

AIRSACCULITIS OF TURKEYS ASSOCIATED WITH CONDEMNATIONS

OBJECTIVES:
Evaluate the role of infection by various types of microorganisms in producing turkey airsacculitis and associated condemnation losses, and investigate methods for the diagnosis and elimination of those infections which contribute significantly to this disease problem.

PROGRESS REPORT: 72/07 73/06
Exp. was performed to compare M. meleagridis (MM) free poults with naturally infected MM poults and experimentally infected poults with M. synoviae (MS) alone and in combination with MM. MM free poults were superior in having less mortality, better feed conversions, less leg problems and condemnations for airsacculitis with absence of twisted necks, synovitis and sinusitis. Chloretetracycline at 50(g) level in the feed had no beneficial effect as compared to untreated control groups infected with MS and combination of MS and MM. In anotner exp. MS was injected into posterior thoracic air sac of day-old poults naturally infected with MM. The poults infected with MS were stunted, high mortality (50%) developed airsacculitis, synovitis, sinusitis compared to 10% mortality in controls. Condemnations for airsacculitis under field conditions continued high because of extensive outbreaks of MG infection complicated with avian influenza, E. coli and Pasteurella infections. The AGP test for avian influenza (AI) has been very effective in identifying AI outbreaks.

INVESTIGATOR: HEDDLESTON K L 3202-11170-002

LOCATION: PO BOX 70 SMY: 1.1
AMES IOWA
START DATE: 28 03 73

GENUS PASTEURELLA

OBJECTIVES:
Define properties of Pasteurella multocida that induce maximum immunologic response in poultry, and those properties that determine virulence and serological specificity.

PROGRESS REPORT: 72/07 73/06
Biochemical and serological studies were conducted on 73 Pasteurella multocida isolants, 13 from waterfowl, 19 from free-flying birds other than waterfowl, 18 from chickens, 5 from turkeys, and 18 from White Pekin ducks. Three serotypes were associated with waterfowl, 4 with chickens, 1 with turkeys, and 1 with domestic ducks. Carbohydrate fermentation reactions were typical except sorbitol which occasionally changed from acid to alkaline. The results on isolants from N.Y. State indicated a relationship among the epornitics of fowl cholera in White Pekin ducks and herring gulls and among some of the chickens, turkeys and a pheasant. A new modification of the Cysteine-sulfuric procedure for the quantitative analysis of heptose and hexose in unhydrolyzed bacterial lipopolysaccharides has been developed. This modification is less subject to interference and has a higher sensitivity than the standard methods used for the analyses of these significant components of many bacterial antigens. Furthermore, for the first time it is possible to determine hexose and heptose concentrations simultaneously on the same sample. This new procedure will be of value in the purification and characterization of specific immunizing antigens of Pasteurella multocida.

INVESTIGATOR: HEDDLESTON K L VSRA7-25R

LOCATION: USDA PO BOX 70 SMY: 1.1
AMES IOWA
START DATE: 11 10 67

GENUS PASTEURELLA

OBJECTIVES:
Define properties of Pasteurella multocida that determine virulence and host specificity, and those properties that induce, and by what procedures, maximum immunologic response in the host.

PROGRESS REPORT: 70/01 73/06
Fowl cholera bacterins prepared from 3 strains of Pasteurella multocida induced immunity in turkeys against homologous cultures only. However, vaccinated turkeys that survived challenge exposure and turkeys exposed to a strain of low virulence were immune when re-exposed to a different immunogenic type, which demonstrated that an immune response to live P. multocida was different from that to killed. Bacterins prepared from tissues of a turkey that died of acute fowl cholera induced immunity against a different immunogenic type of P. multocida. A bacterin prepared with organisms grown on laboratory media did not, demonstrating that a wider spectrum of immunogens is produced in live birds than on laboratory media. Cross immunity was also induced in turkeys with an avirulent strain of P. multocida administered in the drinking water. Heat stable antigens were used in the gel diffusion precipitin test to group P. multocida into 15 serotypes. Good correlation but not absolute, was observed between the serological reaction and the immune response in chickens and turkeys. An immunizing antigen was isolated from saline extracts by high speed centrifugation and agarose column chromatography. Its chemical composition, toxicity, stability and immunogenic properties suggest that it is a free endotoxin. Over 1500 P. multocida isolants from many host species were characterized and added to the NADL Pasteurella culture collection.

INVESTIGATOR: MCLOUGHLIN D K 1105-11930-003

LOCATION: AGRICULTURAL RESEARCH CNTR-EAS SMY: .0
BELTSVILLE MARYLAND
START DATE: 07 01 74

TREATMENTS FOR PREVENTION OR CONTROL OF PROTOZOAN PARASITES OF DOMESTIC ANIMALS

OBJECTIVES:
Evaluation, development, and standardization of chemotherapeutic measures for protozoan diseases of livestock and poultry.

INVESTIGATOR: DORAN D J 1105-11930-002

LOCATION: AGRICULTURAL RESEARCH CENTER SMY: 3.1
BELTSVILLE MARYLAND
START DATE: 20 04 66

MODES OF INFECTION AND HOST-PARASITE RELATIONSHIPS OF INTRACELLULAR PROTOZOA

OBJECTIVES:
Elucidate the mechanism of entry into cells and reasons for host- and cite-specificity of intracellular protozoan parasites of poultry and other farm animals.

PROGRESS REPORT: 72/07 73/06
A semi-microcytochemical procedure for assaying the effects of inhibitors and

anticoccidial compounds was developed. None of the 7 most frequently used coccidiostats affected the enzyme reactions of 6 phosphohydrolases or 4 esterases in endogenous stages of E. tenella. Since quinine, which inhibits penetration by sporozoites, had no effect, it is possible that either none of these enzymes are involved in penetration or that quinine does not inhibit penetration in the form of an enzyme inhibitor. The ultrastructure of 1st generation schizogony was determined for E. tenella grown in chicken kidney cell cultures. The intracellular sporozoites resorbed nearly all organelles preparatory to nuclear division and redifferentiation into merozoites. Eimeria tenella completed its life cycle in kidney cell cultures from 5 species of birds closely related to the chicken, but not in cells from other birds not closely related to chickens. This finding reinforces present concepts of host-specificity, and, since this coccidium completed its life cycle in kidney cell cultures from each of the closely related species, indicates that whatever factors control host-specificity are not present in the kidney.

INVESTIGATOR: GORHAM J R 5802-12040-002

LOCATION: WASHINGTON STATE UNIV SMY: 1.9
PULLMAN WASHINGTON
START DATE: 12 01 66

ENDOPARASITE VECTOR PIONEERING RESEARCH

OBJECTIVES:
Determine the persistence and transmission of certain diseases of domestic animals by internal parasites as laboratory systems for the study of endoparasitic transmission. Determine if parasitism can activate latent virus infections.

PROGRESS REPORT: 72/07 73/06
Syngamus trachea was found to use the blood vascular route in its migration to the lung of birds. This was shown when the larvae were inoculated subcutaneously or intramuscularly. Parenteral injections of S. trachea third stage larvae were more effective in reaching the lungs than by feeding larvae. A survey of internal parasites in Washington cattle revealed that gastrointestinal nematodes, Fasciola hepatica and coccidia are common in Washington. It was found that egg production of Nippostrongylus brasiliensis was markedly prolonged in mice concurrently infected with Nematospiroides dubius. Immunofluorescence is a more sensitive method for detecting low levels of equine infectious anemia virus in leukocyte cultures than cytopathogenicity. The mechanical transmission of Aleutian disease virus through the feeding activities of Aedes fitchii is possible and biological transmission might also occur. The sequential lymphoreticular lesions evoked by Neorickettsia helmintheca (NH) and the Elokomin fluke fever (EFF) agent showed depletion of lymphocytes from thymic dependent areas. Both NH and EFF were isolated from infected dogs and maintained in cultivated monocytes. No differences between the two agents were found regarding culture response and of individual cells.

INVESTIGATOR: COLGLAZIER M L 1105-11190-002

LOCATION: AGRICULTURAL RESEARCH CNTR-EAS SMY: 1.3
BELTSVILLE MARYLAND
START DATE: 06 11 63

EVALUATE NEW AND IMPROVED ANTHELMINTICS FOR DOMESTICATED ANIMALS AND POULTRY

OBJECTIVES:
Discover, develop, and evaluate safe, efficient anthelmintics and other chemical measures against worm parasites of livestock and poultry.

PROGRESS REPORT: 72/07 73/06
The partially cambendazole-resistant strain of the large stomach worm (Haemonchus contortus), previously reported to have been developed experimentally for the first time after 4 drug-exposure passages in lambs, was subjected to 5 more such passages. Incomplete data indicate strongly that a total of 8 drug exposures has resulted in a highly cambendazole-resistant strain. A standard therapeutic dose, normally about 95% effective against the original sensitive strain, became almost ineffective against the drug-exposed strain after 8 exposures. Furthermore, 3x the normally effective dose appeared to be about half as effective against the resistant strain as the normal dose against the drug-sensitive strain.

INVESTIGATOR: LUND E E 1105-11930-001

LOCATION: AGRICULTURAL RESEARCH CENTER
BELTSVILLE MARYLAND

SMY: 1.5

START DATE: 02 01 63

PROTOZOAN PARASITES OF POULTRY DIGESTIVE SYSTEMS

OBJECTIVES:
Evaluate causes, transmission, and nature of poultry protozoan diseases, for diagnosis and control.

PROGRESS REPORT: 72/07 73/06
Rectal transfer of 10-day Heterakis gallinarum larvae from a relatively incompatible host (Japanese quail) to a very compatible host (ring-necked pheasant), and the reverse procedure, indicated that detrimental effects of a poor environment either before or after transfer were not overcome by a good environment for the other part of the life cycle. Host influences of H. gallinarum can affect the transmission of Histomonas meleagridis. Of nine galliform species studied, the ring-necked pheasant, the domestic chicken, and the guinea fowl, in that order, were the species best adapted to perpetuate both Heterakis gallinarum and Histomonas meleagridis. These birds, and particularly the ring-necked pheasant, may be primarily responsible for the survival and dissemination of both parasites. In experimentally infected ducks and geese, Heterakis gallinarum underwent considerable development but did not complete its life cycle. The ducks and all but one of 46 geese were refractory to experimental infection with Histomonas meleagridis.

INVESTIGATOR: TROMBA F G 1105-11920-001

LOCATION: AGRICULTURAL RESEARCH CENTER
BELTSVILLE MARYLAND

SMY: 3.0

START DATE: 27 03 72

BIOLOGICAL CONTROL OF PARASITIC DISEASES

OBJECTIVES:
Develop methods for immunizing animals against parasitic diseases. Define serological and immunological mechanisms which characterize resistance to parasitism. Identify hyperparasites and predators which attack parasitic and free-living stages of helminths.

PROGRESS REPORT: 72/07 73/06
The most successful protocol for administration of excretory gland vaccine was a series of 3 injections, the last being administered on the day of challenge. In a series using a crude extract of S. dentatus intestines, and challenge at 2, 4, or 8 weeks after the second of 2 vaccinations, only principals in the 4 week group were protected. Although significant reductions in larval worm burdens have been demonstrated, long term experiments show that some worms survive and

continue development. Substances inhibiting the proteolytic and esterolytic activity of trypsin and chymotrypsin were found in extracts of the excretory gland cells, intestines, esophagi, reproductive organs and body walls of S. dentatus adults. The specific activity in the excretory gland cells was 45 to 175 times greater than that in the other tissues. A trypsin inhibitor was also demonstrated in media in which juvenile and adult S. dentatus were maintained in vitro. The catalog of enzymes and inhibitors now demonstrated in the excretory gland cells of the kidney worm are strong evidence that these structures are the site of intense secretory rather than excretory activity. A bacteriologic and histologic study has shown that at least 2 and possibly 5 baterial genera are associated with S. dentatus in ureteral cysts. Despite this there was no resultant bacteriuria and, with the exception of a single cuticular lesion, no pathology of S. dentatus was demonstrated.

INVESTIGATOR: LITCHTENFELS J R VSRB6-16

LOCATION: AGRICULTURAL RESEARCH CENTER SMY: .3
BELTSVILLE MARYLAND

START DATE: 19 05 70

IDENTIFICATION OF PARASITES IMPORTANT TO HUMAN AND ANIMAL HEALTH

OBJECTIVES:
Provide an essential service for the identification of parasites of medical and veterinary importance involving research, food products, control, and domestic, laboratory, and wild animals.

PROGRESS REPORT: 67/05 72/12
This work unit is being discontinued. Its activities will be merged with an over-lapping unit (VSRB6-12R). Since 1967 this unit has identified more than 1100 lots of parasites submitted by federal, state, and foreign institutions, universities, commercial laboratories and individuals. Several new genera and species have been described by staff of the unit and many other workers have acknowledged assistance of this unit in publications. The most significant accomplishment is a publication entitled, "Identification of parasitic metazoa in tissue sections," the first publication of its kind. Other significant accomplishments include: the identification and reporting of parasites of food fish that are potential hazards to man; the identification and description of eyeworms of veterinary importance in the face fly, Musca autumnalis, in Massachusetts; and, the statistical quantification of morphological variation in Gongylonema pulchrum, a nematode parasitic in a wide range of veterinary animals and man. This made it possible to distinguish between closely related species, subspecies, or host strains of G. pulchrum, and in one case to identify a new reservoir host, the gray squirrel.

INVESTIGATOR: KATES K C VSRB5-20

LOCATION: AGRICULTURAL RESEARCH CENTER SMY: 2.3
BELTSVILLE MARYLAND

START DATE: 27 07 65

EVALUATION OF ANTIPARASITICS OF ESTABLISHED OR REPORTED VALUE

OBJECTIVES:
Appraise, develop, and standardize levamisole, cambendazole, buquinolate, ronidazole and other antiparasitic chemicals used against parasitic infections of livestock and poultry; determine mode of action of selected drugs.

PROGRESS REPORT: 70/09 73/10
Efficacy of thiabendazole (TBZ), levamisole (LVS) hydrochloride, morantel tartrate (MT), cambendazole (CBZ), and mebendazole (MBZ) was compared against

natural infections of helminths in sheep. LVS gave best control of nematodes; only CBZ controlled tapeworms. The large stomach worm was resistant to all benzimidazoles--TBZ, CBZ, and MBZ, but was removed by LVS and MT. Intestinal threadworm was controlled best by CBZ and TBZ, satisfactorily by LVS, but not by MT and MBZ. Under conditions of high exposure to infection, LVS prevented death and reduced morbidity; in absence of benzimidazole-resistant species, the other drugs could be as useful as LVS. Clopidol, novastat, decoquinate, buquinolate, and nequinate were tested for efficacy against sensitive and specific coccidiostat-resistant strains of Eimeria tenella. All controlled the sensitive strain adequately. One or more of the resistant strains was cross resistant to at least one of the test compounds, except clopidol.

INVESTIGATOR: LICHTENFELS J R VSRB6-12R

LOCATION: AGRICULTURAL RESEARCH CENTER
BELTSVILLE MARYLAND

SMY: .3

START DATE: 06 12 67

TAXONOMY OF HELMINTHS AND OTHER PARASITES

OBJECTIVES:
Provide fundamental information on the morphology, classification, geographic distribution, life history, host-parasite relationships, and transmission of parasites and parasitism in livestock, poultry, and wildlife.

PROGRESS REPORT: 70/01 73/06
This work has been revised and combined with unit 0040165.

INVESTIGATOR: KUNZ S E 7302-15490-001

LOCATION: VET TOX & ENT RESEARCH LAB
COLLEGE STATION TEXAS

SMY: 2.6

START DATE: 28 02 72

STUDIES OF LICE, MITES, TICKS, AND FLEAS AFFECTING LIVESTOCK AND POULTRY

OBJECTIVES:
Determine the normal physiology and chemistry of the lice, mites, ticks, and fleas affecting livestock and poultry, and determine the effects or changes produced by selected toxicants, other chemicals or conditions of stress on the cells, organs and physiological systems.

PROGRESS REPORT: 72/07 73/06
The wing louse, Liperus caponis, has been successfully reared on baby chicks and has been reared from egg through adult in vitro in temperature cabinets. A fungus, Laboulbeniales sp., has been found infecting several species of poultry lice and histological sections show the fungus to have a haustorium that penetrates the cuticle. Mycelium penetrates fat bodies and adjacent muscles. Pathological examination of skin lesions on poultry that were heavily infested with Menacanthus stramineus showed that initial lesions were caused by the lice but pathology was primarily caused by secondary bacterial infections of Proteus, Pseudomonas, Bacillus, Staphylococcus and Escherichia. Single leg bands containing 15% dichlorvos applied to 2300 grown turkey hens completely controlled turkey chigger mites throughout a 26-day test. Biology and ecology studies indicate an immediate decline in chigger activity following rains with an increase 4-8 days later.

INVESTIGATOR: ROGOFF W M 00ENTH0406

LOCATION: 5544 AIR TERMINAL DRIVE SMY: 1.1
FRESNO CALIFORNIA
START DATE: 28 01 68

WESTERN LICE, MITES, TICKS, AND FLEAS AFFECTING LIVESTOCK AND POULTRY

OBJECTIVES:
Study biology and control methods for lice, mites, ticks, and fleas of livestock and poultry in Western States for the purpose of developing cheaper, more effective methods of control.

PROGRESS REPORT: 68/06 73/08
Project inactive following relocation from Corvallis, Ore., to Fresno, Calif. Feb. 1968.

INVESTIGATOR: LICHTENFELS J R 1105-12040-003

LOCATION: AGRICULTURAL RESEARCH CENTER SMY: .2
BELTSVILLE MARYLAND
START DATE: 19 05 70

MAINTENANCE OF PARASITE COLLECTION

OBJECTIVES:
Accumulate, organize, and maintain a world-wide collection of parasites of livestock and other animals to be used as a research tool in the identification, classification, distribution, and host study of the specimens.

PROGRESS REPORT: 72/07 73/06
Accessions to the National Parasite Collection totaled 741 lots including 278 trematode, 305 nematode, 130 cestode, 14 arthropod, 12 protozoan, and 2 acanthocephalan lots. Loans of specimens for research purposes were made to more than 200 scientists around the world. Exchanges of specimens have been effected between this Collection and British, French, and Australian National Collections. Considerable progress has been made toward the preparation of a publication listing type specimens accessioned in the Collection.

INVESTIGATOR: DRUMMOND R O 7305-15490-001

LOCATION: USDA LIVESTOCK INSECT LAB SMY: 2.6
KERRVILLE TEXAS
START DATE: 23 06 69

BIOLOGY AND CONTROL OF LICE, MITES, TICKS, AND FLEAS AFFECTING LIVESTOCK AND POULTRY

OBJECTIVES:
Develop improved methods for control of lice, mites, ticks, and fleas affecting livestock and poultry through study of biology, ecology, insecticide uses, and biological control techniques.

PROGRESS REPORT: 72/07 73/06
Only 5 compounds screened against cattle ticks were effective at 0.01%; dips of solubilized Cpd 1072 killed ticks through 14 months. Gamma radiation sterilized male lone star ticks and lowered sexual activity. Tropical horse ticks were killed on cattle fed famphur. Of acaricides tested on the brown dog tick, chlorinated hydrocarbons were relatively ineffective. Juvenile hormone analogs neither killed lone star ticks nor affected molting or fertility. Boophilus microplus from Texas were not resistant to acaricides. Data on 29 acaricides

for control of lone star ticks were correlated with data on the same acaricides for control of other ticks. Fed male Gulf Coast ticks produce a pheromone that attracts females; extracts mixed with insecticides killed females. Diet of cattle affected yield, size, and parasitic period of female fever ticks; fewer developed on cattle fed high-protein diet than on cattle on low-protein diet. Gulf Coast ticks were genetically isolated from lone star ticks, but some females reproduced by gynogenetic parthenogenesis. Pastures deferred or stocked with exotic game had fewer lone star ticks than those stocked with cattle, sheep, and deer. Of 85 compounds screened with cattle biting lice, only Zoecon ZR-619 was more active as a juvenile hormone than the standard. Screening tests determined the minimum dosage of insecticides for control of lice and mites on poultry for 4-6 weeks. A spray of 20 ml/chicken of nontoxic synthetic hydrocarbon controlled northern fowl mites.

INVESTIGATOR: SONGER J R 3202-11170-006

LOCATION: PO BOX 70
AMES IOWA

SMY: .0

START DATE: 14 11 73

BIOLOGICAL HAZARDS FROM INFECTIOUS, TOXIC, OR HAZARDOUS MATERIALS IN ANIMAL DISEASE STUDIES

OBJECTIVES:
Assess hazards inherent in research with various infectious, toxic, or hazardous materials related to livestock disease and develop procedures or equipment to control or eliminate these hazards.

INVESTIGATOR: SHAW J H 1105-12040-002

LOCATION: AGRICULTURAL RESEARCH CENTER
BELTSVILLE MARYLAND

SMY: .9

START DATE: 19 05 70

MAINTENANCE CATALOGUES OF INDEX-CATALOGUE OF MEDICAL AND VETERINARY ZOOLOGY

OBJECTIVES:
Provide working tool in the form of an index to world's literature on medical and veterinary zoology for use by researchers in parasites and parasitic diseases of animals and man.

PROGRESS REPORT: 72/07 73/06
Additions to the Catalogue are as follows: Author entries, 10,950; Parasite-Subject entries, 33,290 (including 18,780 parasite, 2,840 treatment, 6,350 subject headings and 5,320 hosts). New genera and species of parasites are as follows: Protozoa, 17 n.g., 147 n.sp.; Trematoda, 31 n.g., 130 n.sp.; Cestoda, 5 n.g., 31 n.sp.; Nematoda and Acanthocephala, 10 n.g., 130 n.sp.; Arthropoda, 41 n.g., 255 n.sp. 160 new citations of periodicals containing pertinent literature were added to the Catalogue. Filed into the main catalogues from published parts were over 90,000 entries. Preliminary work has continued on a comprehensive bibliography on piroplasmosis. Several visitors from the United States and foreign countries consulted the

INVESTIGATOR: SHAW J H 1105-12040-001

LOCATION: AGRICULTURAL RESEARCH CENTER SMY: .9
BELTSVILLE MARYLAND
START DATE: 24 04 69

PUBLICATION, CATALOGUES OF INDEX-CATALOGUE OF MEDICAL AND VETERINARY ZOOLOGY

OBJECTIVES:
Publish the Author, Parasite-Subject, and Host Catalogues of the Index-Catalogue of Medical and Veterinary Zoology so that the information they contain on the world's parasitological literature will be available to all scientists, veterinarians, and physicians.

PROGRESS REPORT: 72/07 73/06
Published: Supplement 18, Part 5, Arthropoda and Miscellaneous Phyla; Special Publication No. 2, A Bibliography on Chagas' Disease (1909-1969). In press: Supplement 18, Part 6, Subject Headings and Treatment; Supplement 19, Part 1, Authors A to Z; Special Publication No. 3, Ticks and Tickborne Diseases, 1, Ticks, Parts 1-3, and 11, Hosts, Parts 1-3. In preparation for publication: Supplement 18, Part 7, Hosts; Supplement 19, Part 6, Subject Headings and Treatment.

INVESTIGATOR: RILEY J L 3202-11200-005

LOCATION: P O BOX 70 SMY: .3
AMES IOWA
START DATE: 31 05 72

BIOMEDICAL INSTRUMENTATION FOR GATHERING, ANALYZING, AND RECORDING RESEARCH DATA

OBJECTIVES:
Design and develop biomedical instrumentation for gathering, analyzing and recording research data.

PROGRESS REPORT: 72/07 73/06
During the past year some work has been done in developing a temperature transmitter for use in small animals. Integrated circuits have been used to build a less expensive and more reliable frequency to voltage converter to give long term temperature recordings. This is nearly complete. The circuit to give a recording of total counts under a curve from a liquid scintillation counter has been completed. Some work has been done in developing a booster transmitter. An inexpensive pressure transducer for measuring rumen activity has been developed. Printed circuit boards for making the telemetry system easier to build are being developed.

INVESTIGATOR: JUNNILA W A 211-007-D508

LOCATION: UNIV OF MINNESOTA SMY: 1.0
ST PAUL MINNESOTA
START DATE: 01 11 67

PERFORMANCE OF ELECTRICALLY HEATED CHICK AND POULT BROODERS

OBJECTIVES:
Design and evaluate a brooder for chicks and one for poults which provides environments conducive to bird growth but not to disease development.

PROGRESS REPORT: 67/11 73/06
Quartz lamps reduced starve-out losses in turkeys by 2.7% and mortality from handling by 3.3%. A solid-state controller was designed and constructed for modulating energy output of radiant heat for brooding. Constructed a building lined with a film impermeable to penetration by bacteria. Two pens of turkey poults remained free of salmonella infection in the lined building compared to 50% of commercial flocks becoming infected in the house environment. Mycoplasma meleagridis (MM) and Mycoplasma synovia (MS) caused no mortality in artifically infected turkey poults housed under gas-type radiant brooders or combined gas and electric radiant brooders. Heating provided by a direct-fired air heater of pen areas lined with plastic sheeting to contain pressurized warm air and with small openings around the perimeter resulted less labor, better sanitation, and stronger legs of birds. Buildings must be tight for proper operation of direct-fired air heaters. Modification of controls for this system were made for manufacturers. Fryer-roaster turkeys showed no difference in incidence of disease at ambient temperatures of 65°F and 85°F. The research over this period showed that proper housing, brooders, and heating will reduce significantly turkey poult losses.

INVESTIGATOR: DEATON J W 29-030-312-25-088

LOCATION: MISSISSIPPI STATE UNIVERSITY SMY: .2
STATE COLLEGE MISSISSIPPI
START DATE: 17 04 68

TEMPERATURE-DENSITY INTERACTION FOR BROILERS

OBJECTIVES:
Determine if a temperature-density interaction exists for broiler performance.

PROGRESS REPORT: 68/04 73/04
1. Determined that when broilers are infected with Mycoplasma gallisepticum and subjected to a severe bronchitis stress, management factors such as bird density level affect broiler condemnation. 2. Determined that a temperature-density interaction exists for broiler body weight gain for floor-reared broilers. That is, during high temperature conditions, temperature depresses growth to a point where other growth depressant effects are obscured. 3. Determined that optimum stocking rate for broilers reared in cages to 8 weeks of age is approximately 0.5 ft.^{2} per bird when growth and product quality are considered. 4. Determined that under summer conditions, heavier birds can be produced in cages than on the floor; however, a considerable amount of the increased weight produced is in the form of fat. 5. A formula was developed and tested to equate broiler weight on amount of meat produced per unit of floor area rather than number of birds produced per unit of floor area when broiler sexes are reared separately.

INVESTIGATOR: DEATON J W 29-030-312-25-087

LOCATION: MISSISSIPPI STATE UNIVERSITY SMY: .2
STATE COLLEGE MISSISSIPPI

START DATE: 17 04 68

TEMPERATURE AND BROILER LOSSES

OBJECTIVES:
Determine if temperature as a direct exposure is a stress that results in increased broiler losses due to condemnations, mortality and decreased body weight gain.

PROGRESS REPORT: 68/04 73/04
1. Found that to obtain maximum growth in the summer months, light should be available to broilers when the temperature is coolest during the 24-hour period (from midnight to daybreak). 2. In an attempt to determine if temperature exposure is a direct stress affecting broiler condemnation, 14 trials were conducted using broiler chicks without and infected with Mycoplasma gallisepticum. Conclusions are: a) temperature stress in the absence of an infection does not cause condemnation, and b) short-term temperature stress in the presence of Mycoplasma gallisepticum does not cause increased condemnation over controls, and c) the most likely cause of high condemnations due to airsacculitis is Mycoplasma gallisepticum infection coupled with another properly timed respiratory infection. 3. The value of evaporative cooling for floor-reared broilers was found to be marginal under normal summer temperature cycles (75°-95°F.). Under high summer temperature regimes (75°-100°F.) evaporative cooling significantly increased broiler growth. 4. Environmental conditions causing heat prostration of broilers were characterized.

INVESTIGATOR: DEATON J W 29-030-312-25-086

LOCATION: MISSISSIPPI STATE UNIVERSITY SMY: .3
STATE COLLEGE MISSISSIPPI

START DATE: 17 04 68

THE INTERRELATION OF NUTRITIONAL AND ENVIRONMENTAL FACTORS IN BROILER LOSSES

OBJECTIVES:
Investigate value of added nutrients when environmental stress causes broiler losses.

PROGRESS REPORT: 68/04 73/04
Found that broilers do not necessarily eat to satisfy their energy requirements. Found that rearing temperature and dietary energy level significantly affected carcass ether extract content and abdominal fat of broilers. At low temperatures, it has been found that copper and iron deficiencies significantly affect mortality with copper being first limiting. Found that synthetic lysine as high as 0.2% can be used in broiler rations without adversely affecting growth or feed utilization. This resulted in a 3% reduction in total dietary protein (21% to 18%); at current prices, reduces feed cost by $6.00 per ton. Found that Peruvian fish meal fed at high levels was the factor causing enteritis and mycosis of broilers. The causative agent has not been identified. Found that excreta from broilers in cages contains 10-14% amino acids and 6-7% total nitrogen. Percent material ether extractable was approximately 3.75%. Drying temperature and diet influence excreta composition. Found that mortality due to heat prostration was not significantly affected by dietary level of animal fat. Found that males require a higher protein diet than females for maximum growth.

INVESTIGATOR: BOUCHILLON C W 29-030-312-25-091

LOCATION: MISSISSIPPI STATE UNIVERSITY SMY: .1
STATE COLLEGE MISSISSIPPI
START DATE: 15 08 68

THERMODYNAMIC ANALYSES OF A BROILER

OBJECTIVES:
Theoretically predict the effect of temperature, humidity and air velocity on heat loss of broilers.

PROGRESS REPORT: 67/07 73/05
A thermal model of a poultry house including the heating, cooling, ventilation requirements, the construction materials and configuration, and heat and moisture production of the broiler chickens as a function of several parameters related to size of the chicken, was developed for analysis by digital computer. In order to use the model it was necessary to have information concerning the wall and ceiling overall heat transfer coefficients, representing the selected insulation and construction, outside temperature and humidity, the desired inside temperature and humidity conditions, the stocking rate for the chickens and detailed information concerning the growth rates of biological metabolic rates, feed consumption, waste moisture production, and other parameters such as respiration rate, tidal volume, insulating value of feathers, etc. The final model presented solutions for the ventilation rate, the house heating and cooling rate as required as a function of the outside dry bulb temperature, humidity, and the chicken age.

INVESTIGATOR: OTA H 312-019-B201

LOCATION: AGRICULTURAL RESEARCH CENTER SMY: 1.3
BELTSVILLE MARYLAND
START DATE: 01 04 68

POULTRY ENVIRONMENTAL FACILITIES

OBJECTIVES:
Develop design criteria for laying, broiler, and turkey houses.

PROGRESS REPORT: 72/01 72/12
Heat production equations were developed for both sexes of Japanese quail at air conditions between 60 and 90°F. During lighted hours, the female latent heat production was 3.5 BTU/hr per lb liveweight which decreased to 2.5 BTU/hr at night at all air condition levels. Above 75°F, males emitted nearly 30% less latent heat than females. At night and above 75%°F air temperature, males excreted an additional conical marshmallow-like matter and their latent heat was nearly 50% higher than the larger females. The third and final 6-month trial involving three energy levels (1000, 1200, 1400 kcal ME/lb feed) fed to Leghorn layers was started. Hens maintained at 70 °F or 85 °F and 50% RH did not decrease egg production, egg size or specific gravity scores. Hens receiving the 1400 kcal ME diet showed 0.3 to 0.5 mm less albumen height than those fed the other diets. In the cooler air, hens fed the 1000 kcal ME diet produced 40 to 50% more droppings than those fed the 1400 kcal ME diet. Humidity had little effect on latent heat production of broiler chicks maintained at 84 °F from hatch to 0.3 lb liveweight, but more sensible heat was emitted in the humid air. Beyond 0.3 lb liveweight, the latent heat production increased from 1 BTU/broiler at 84°F to 8 BTU at 40°F while sensible heat production increased from 8 BTU at 84°F to 50 at 40°F. Air humidity affected the sensible heat loss at all air temperatures except at 77±2°F. The best liveweight gains to 1.2 lb were obtained at air conditions between 77°F and 50% RH and 84°F and 50% RH. Beyond 1.2 lb size, the best gains were made at air conditions between 67 to 77°F.

INVESTIGATOR: REECE F N 312-019-D313

LOCATION: SOUTH CENTRAL POULTRY RES LAB SMY: 1.6
STATE COLLEGE MISSISSIPPI
START DATE: 30 11 67

ELECTRIC CONTROLS AND ENVIRONMENTAL EQUIPMENT FOR BROILER PRODUCTION

OBJECTIVES:
Develop design criteria for electric controls and environment equipment through the study of relationships among environmental stress, broiler diseases, and other factors that cause poor performance and condemnation.

PROGRESS REPORT: 67/11 72/11
A labor and energy saving system for control of ventilation and heating in poultry production houses was developed and tested. A laboratory facility for research on application of microwave energy to poultry disease control was placed in service. Environmentally controlled chambers (10) have been built and poultry houses (3) have been modified to provide superior research facilities for poultry environment, management, nutrition, physiology and disease research. A feed mill necessary for poultry nutrition research and quality control has been designed, constructed and placed in service.

INVESTIGATOR: DEATON J W 7502-15500-004

LOCATION: SO CENTRAL POULTRY RESEARCH LA SMY: .0
STATE COLLEGE MISSISSIPPI
START DATE: 13 03 74

POULTRY LOSSES DUE TO MANAGEMENT AND ENVIRONMENT

OBJECTIVES:
Determine the optimum environment and management system for maximum production of poultry products.

INVESTIGATOR: REECE F N 7502-15500-005

LOCATION: SO CENTRAL POULTRY RESEARCH LA SMY: .0
STATE COLLEGE MISSISSIPPI
START DATE: 13 03 74

STRUCTURES AND EQUIPMENT FOR POULTRY PRODUCTION AND WASTE MANAGEMENT

OBJECTIVES:
Develop design criteria for structures and equipment that will improve production efficiency, reduce labor requirements, improve product quality, and facilitate waste handling for poultry production systems.

INVESTIGATOR: WILEY W H 1106-16112-004-A

LOCATION: CLEMSON UNIV SMY: .0
CLEMSON SOUTH CAROLINA
START DATE: 18 03 74

PROJECT TURKS: TURKEY UPDATED RESEARCH KNOWLEDGE SYSTEM

OBJECTIVES:
Maintain a readily available current information source from published reports of turkey research.

INVESTIGATOR: BITMAN J 1106-11571-001

LOCATION: AGRICULTURAL RESEARCH CNTR-EAS SMY: .4
BELTSVILLE MARYLAND
START DATE: 18 12 68

ESTROGEN CONTROL OF FEMALE REPRODUCTIVE TISSUES DURING GROWTH, ESTROUS CYCLE, AND IN IMPLANTATION PL

OBJECTIVES:
Determine whether estrogen controls reproductive function through a primary action on tissue permeability and substrate availability, or on enzyme and protein synthesis. Determine biochemcial changes on uterus and vigina. Investigate factors promoting or inhibiting natural and artificial decidualization, implantation, early blastocyst development. Determine relation of secretion and excretion rate of female sex hormones to reproductive function.

PROGRESS REPORT: 72/07 73/06
Further attempts to develop a satisfactory bioassay for identification of the natural sex attractant in hamsters have been unsuccessful. A female hamster model was constructed by a taxidermist and used in several trails with vaginal secretions from estrous and anestrous females.

INVESTIGATOR: SEXTON T J 1106-16112-001

LOCATION: AGRICULTURAL RESEARCH CNTR-EAS SMY: .8
BELTSVILLE MARYLAND
START DATE: 13 06 73

PRESERVATION OF POULTRY SPERMATOZOA

OBJECTIVES:
Develop methods for long term storage of chicken and turkey semen without critical loss of fertilizing capacity.

INVESTIGATOR: MERKLEY J W 1209-11520-003

LOCATION: UNIVERSITY OF DELAWARE SMY: .6
GEORGETOWN DELAWARE
START DATE: 28 10 71

THE EFFECT OF DIET AND MANAGEMENT ON BONE STRENGTH IN BROILERS

OBJECTIVES:
Determine dietary causes of the high incidence of broken bones, and determine the influence of exercise upon bone strength and muscle quality.

PROGRESS REPORT: 72/07 73/06
Three experiments were conducted. Unilateral wing immobilization of broiler males at various ages for various periods of time were tested as well as recovery. Measurements made on each wing were: total weight, muscle and cartilage weights, bone weights, bone shell thickness, bone midpoint diameter, bone density, bone ash, calcium, and phosphorus, and midpoint breaking strength. Immobilization resulted in significantly lower breaking strengths than the free wing. The effect of bone storage on breaking strength of bones was studied using, fresh (no storage), fresh-frozen and thawed, dried and stored, dried, defatted and stored, and dried and stored for 2 months. All methods were found to be satisfactory methods of storage as measured by coefficient of variation. Fans were employed to direct a current of air through the floor of coops in an attempt to force exercise broilers in coops. Fans ran for 15 seconds each 1/2 hour from 6-8 p.m. in the last 2 weeks of the growing period. When the fan treated birds were compared with controls a trend of increased bone strength of numeri was observed.

INVESTIGATOR: OPEL H 1106-16112-002

LOCATION: AGRICULTURAL RESEARCH CNTR-EAS SMY: 1.0
BELTSVILLE MARYLAND
START DATE: 13 06 73

CONTROL OF BROODINESS IN POULTRY

OBJECTIVES:
Analyze physiological factors controlling onset of broodiness in chickens and turkeys, including those that suppress egg production and those that initiate broody behavior.

INVESTIGATOR: NIGHTINGALE T E 1209-11520-004

LOCATION: UNIVERSITY OF DELAWARE SMY: .6
GEORGETOWN DELAWARE
START DATE: 28 10 71

THE EFFECT OF ACUTE AND CHRONIC ANEMIA ON CARCASS QUALITY OF BROILER-TYPE CHICKENS

OBJECTIVES:
To study production factors, such as nutrition and physiology that result in anemic birds and to determine how these effect the condition of broilers at marketing.

PROGRESS REPORT: 72/07 73/06
Two aspects of cardiovascular function in acute anemia have been studied to date. Using isovolemic serial infusions of 6% dextran 70 in isotonic saline in volumes equal to 1% of body weight, we have observed a linear reduction in hemoglobin (Initially 10-13 gm% to 3-5 gm% after 3 infusions) and hematocrit (Initially 25-34 vols% to 3-6 vols% after 3 infusions). However, cardiac output and stroke volume were noted to increase (from 120-210 ml/min/kg to 135-340 ml/min/kg and 1.0-2.4 ml/beat to 1.4-3.3 ml/beat, respectively) following the first infusion and remain essentially unchanged thereafter. Peripheral vascular resistance, calculated as the ratio of mean blood pressure/cardiac output, decreased over two infusions from 170-260 mm Hg/L/min to 100-160 mm Hg/L/min, while mean circulation times decreased over three infusions from 5.5-6.4 seconds to 2.6-3.8 seconds. Heart rate and right atrial blood pressure remained unchanged. These data are indicative of a hyperkinetic circulatory state which has been described for anemic mammals. To determine if cardiovascular function was augmented in acute anemia, we examined myocardial contractility as shown by left ventricular dP/dt, afterload by mean aortic pressure, and preload by left

ventricular end-diastolic pressure. We found no significant changes in these parameters during acute anemia. It thus appears that circulatory changes in acute anemia are peripherally mediated via local or generalized vasodilation.

INVESTIGATOR: OPEL H 1106-16112-003

LOCATION: AGRICULTURAL RESEARCH CNTR-EAS SMY: .6
BELTSVILLE MARYLAND
START DATE: 13 06 73

NEUROENDOCRINE CONTROL OF EGG PRODUCTION IN TURKEYS

OBJECTIVES:
Study the role of environmental factors and endocrine feed-back mechanisms in the control of gonadotrophin release, with the aim of improving the rate and duration of cyclic egg production in turkeys.

INVESTIGATOR: ARCOS M 29-011-310-21-046

LOCATION: AGRICULTURAL RESEARCH CENTER SMY: .2
BELTSVILLE MARYLAND
START DATE: 17 04 68

OVARIAN FEEDBACK HORMONES (ESTROGENS, PROGESTOGENS, POSSIBLY ANDROGENS) IN THE AVIAN OVULATION CYCLE

OBJECTIVES:
Determine tissue and blood levels of ovarian feedback hormones in relation to timing of follicular maturation and release of gonadotrophin for ovulation.

PROGRESS REPORT: 68/04 72/06
Plasma progesterone concentrations were measured in regularly ovulating chickens by gas-liquid chromatography (GLC). Each ovulation in a 3-egg sequence was preceded by a pronounced surge of progesterone which began at 8-12 hr before ovulation, reached a peak at 2-4 hr, then declined to basal levels at the time of ovulation. Peak progesterone values ranged form 3.61-7.90 ng/100 ml of plasma. No rise in progesterone occurred on the day of missed ovulation between sequences. Plasma estradiol concentrations were measured in ovulating hens by radioimmunoassay. Preliminary results indicate that estradiol levels rise significantly at 4-8 hrs prior to ovulation and decline to basal levels at ovulation. Peak estradiol levels ranged from 70 to 350 pcg/ml of plasma. Using intravenously injected radioactive steroids, the incorporation of estradiol and progesterone into egg yolk was shown for the first time. With consecutive daily injections of H^3-estradiol or H^3-progesterone, a steady state of transfer of each steroid from blood to the yolk of rapidly growing ovarian follicles was reached on day 5. Ovarian steroids in the blood plasma of the turkey hen were determined by GLC.

INVESTIGATOR: OPEL H 29-011-310-21-102

LOCATION: AGRICULTURAL RESEARCH CENTER SMY: .3
BELTSVILLE MARYLAND
START DATE: 03 02 69

ENVIRONMENTAL CONTROL OF NEUROENDOCRINE MECHANISMS IN BIRDS

OBJECTIVES:
Determine how changes in the external environment are translated into changes in

neuroendocrine mechanisms that ultimately control gonadotrophin secretions, water balance and endocrine and metabolic adjustment to stress.

PROGRESS REPORT: 69/03 72/06
A systematic scan of the hen's brain following i.v. injection of radioactive steroids disclosed the existence of two hypothalamic areas that selectively accumulate progesterone, but not estrogens. Progesterone uptake in the anterior hypothalamic site, but not in the caudal hypothalamic site, varied with the reproductive state of the hen. Selective destruction of the caudal site by electrolytic lesions showed it not to be involved in gonadotrophic function. Studies of partial or total deafferentation of hypothalamic regions in the hen indicated that the preoptic region controls the cyclic release of LH for ovulation, while the basal tuberal region regulates tonic secretions of gonadotrophins for ovarian maintenance. Implantation of crystalline prolactin into the hen's brain indicated that prolactin induces broodiness by action on two brain systems; one controlling behaviour and the other the suppression of gonadotrophin secretion by the pituitary.

INVESTIGATOR: DEATON J W 29-030-312-25-089

LOCATION: MISSISSIPPI STATE UNIVERSITY SMY: .3
STATE COLLEGE MISSISSIPPI
START DATE: 17 04 68

PHYSIOLOGICAL CHANGES ASSOCIATED WITH HYPOTHERMIA AND HYPERTHERMIA OF BROILERS

OBJECTIVES:
Determine the physiological changes associated with broilers in a hypothermic and hyperthermic condition.

PROGRESS REPORT: 68/04 73/04
1. Determined that brooding and rearing broiler chicks in low versus high environmental temperatures results in changes as much as 80% greater for liver, heart, adrenal, hematocrit, hemoglobin and plasma protein levels for low environmental temperature reared chicks. 2. Short-term comatose hypothermic conditions during the first week of age did not significantly affect body weight, mortality or condemnation of 8-week-old broilers. 3. Increasing the size of the heart with low temperature brooding did not significantly affect the electrical axis of the heart; however, the RS wave amptitude was significantly increased for the group brooded in low temperatures. 4. Determined that the increased hematocrit for the low-temperature-reared birds was not due to hemoconcentration, but instead was caused by a greater increase in cell volume than plasma volume. 5. Rearing broilers at low versus high temperatures results in increased plasma lysine levels for broilers at the low temperatures.

INVESTIGATOR: DEATON J W 7502-15500-002

LOCATION: SOUTH CENTRAL POULTRY RES LAB SMY: .6
STATE COLLEGE MISSISSIPPI
START DATE: 11 03 69

PHYSIOLOGICAL RESPONSE OF BROILER CHICKENS TO AMBIENT TEMPERATURES

OBJECTIVES:
Determine the physiological adjustment of broilers to various ambient temperatures.

PROGRESS REPORT: 72/07 73/06
No progress reported this period.

INVESTIGATOR: MAY J D 7502-15500-003

LOCATION: SOUTH CENTRAL POULTRY RES LAB SMY: .6
STATE COLLEGE MISSISSIPPI
START DATE: 26 05 70

PHYSIOLOGICAL AND BIOCHEMICAL IMPLICATIONS INVOLVED IN ACCLIMATION OF POULTRY TO ITS ENVIRONMENT

OBJECTIVES:
Determine the physiological and biochemical factors involved in acclimation of poultry to its environment.

PROGRESS REPORT: 72/07 73/06
Commercial broilers at 8 weeks reared in cages have approximately 7% more body fat than floor-reared broilers. Utilization of thyroxine increases as environmental temperature decreases. Immediate measurement of thyroxine utilization is very important to detect differences. Lipotropic agents, such as choline chloride and inositol, reduce the amount of fat in liver tissue; however, they do not reduce the amount of fat in the abdominal area. A significant difference in the digestive system of broilers reared in cages versus floor has been documented. Feeding litter or shavings to the cage-reared broilers eliminates the digestive system difference.

INVESTIGATOR: SIEGEL H S 7902-16110-004

LOCATION: USDA SE POULTRY RESEARCH LAB SMY: 1.9
ATHENS GEORGIA
START DATE: 13 05 70

RESPONSES OF CHICKENS TO HORMONAL AND ENVIRONMENTAL STIMULI

OBJECTIVES:
Measure and relate endocrine, metabolic and immunological responses of chickens to unfavorable environments. Determine how and at what rate acclimatization for survival and productivity occurs in such environments.

PROGRESS REPORT: 72/07 73/06
Effect of environmental temperature on long bone characteristics of WPR broilers reared in plastic coops and on litter was evaluated. Breaking strength and percent ash were lower in coop-reared chickens and high temperature intensified this effect. Serum alkaline phosphatase and the bicarbonate index were lower in chickens raised at the higher temperature, but effects of coop-rearing were not observed. Young chickens pretreated with a B-adrenergic blocker, were able to maintain lower heart rates during acute heat exposure than non-treated controls although the body temperature of treated birds was elevated. Treated birds also maintained high respiration rates for longer periods. Plasma adrenalin, which increased significantly in non-treated birds in acute heat, did not increase significantly in propranolol-treated birds.

INVESTIGATOR: BALDOCK J D 0701-13721-003-A

LOCATION: VIRGINIA POLY INST SMY: .1
BLACKSBURG VIRGINIA
START DATE: 22 06 73

RAPID ANALYSES OF ANTIBIOTIC RESIDUES IN MEAT AND ORGAN TISSUES

OBJECTIVES:
Develop rapid methods for the analyses of antibiotic residues in meat and organ tissues of slaughter animals.

INVESTIGATOR: WILLIAMS A K CFE2-28

LOCATION: RICHARD B RUSSELL AGR RES CENT SMY: .5
ATHENS GEORGIA
START DATE: 23 07 70

B-VITAMIN CONTENT OF RAW AND COOKED CHICKEN AND LEGUMES

OBJECTIVES:
Analyze chicken parts and dry legumes for vitamin B(6), thiamin, riboflavin, niacin, folic acid (if feasible), and vitamin B(12) (chicken only), and determine their loss on cooking.

PROGRESS REPORT: 70/07 73/07
Two methods have been developed for the assay of individual vitamin B(6) components. The first, a gas-liquid chromatographic procedure exhibits a high sensitivity, but required tedious derivatization procedures. The second, an ion exchange chromatographic determination has the advantage of simple preliminary preparation, but is not so sensitive as the first method. Both methods, while satisfactory for simple mixtures such as pharmaceutical preparations, suffer from severe interference when applied to complex mixtures such as foodstuffs or other biological materials. These methods, while offering a considerable saving in time over the conventional microbiological methods, must await the development of technology for practical "clean-up" before they can be utilized for routine determination of vitamin B(6) in food products.

INVESTIGATOR: FRIES G F 1103-11210-001

LOCATION: RM 227 ADM BLDG ARC-WEST SMY: 1.3
BELTSVILLE MARYLAND
START DATE: 16 05 72

CHEMICAL RESIDUES IN MILK AND TISSUES OF FARM ANIMALS

OBJECTIVES:
Determine the primary source of non-pesticide chemicals contaminating farm animals and their products. Determine the relationship of intake to body stores and excretion of non-pesticide chemicals and the factors affecting them. Determine the physiological effects of such chemicals and their major metabolites.

PROGRESS REPORT: 72/07 73/06
The PCB compounds which exert the greatest adverse effects on hatchability in chickens have been identified. They are Aroclors 1242, 1248, 1232 and 1254 in that order of toxicity. The time of embryonic death has been found to be mainly on day 20 and 21, shortly before hatching. In fact, a large percentage of the chicks "pip" the shell, but are unable to emerge. Thirty-four percent of the dead embryos were abnormal. The major defect is edema, while unabsorbed yolk is the next most common terata. The effects of twelve PCBs on drug and liver metabolism was investigated using the pentobarbital sleeping time method. Polychlorinated biphenyls (Aroclor 1221, 1232, 1242, 1248, 1254, 1260, 1262 and 1268) polychlorinated terphenyls (Aroclor 5442 and 5460), a mixture of bi- and terphenyls (Aroclor 4465) and a polybrominated biphenyl (BP-6) were administered in a single dose, 100 mg/kg body weight injected orally, to mature male and female quail.

INVESTIGATOR: CALVERT C C 1103-14740-002

LOCATION: AGRICULTURAL RESEARCH CENTER SMY: 1.1
BELTSVILLE MARYLAND

START DATE: 09 03 72

RESIDUES IN MANURE PROCESSED FOR LIVESTOCK FEED

OBJECTIVES:
Determine residues from feed additives and from inadvertent sources in livestock and poultry manure processed for feeding and their effects on livestock performance and accumulation in animal products.

PROGRESS REPORT: 72/07 73/06
Sheep (growing wethers) fed arsenic from arsanilic acid excrete an average of 87% of ingested arsenic via feces and urine. Seventysix percent of the excreted arsenic was in feces. Arsenic was also detected in liver, kidney, blood, and muscle of sheep (mature wethers) fed arsanilic acid for a 28-day period. The levels fed were 0, 27, 144, and 273 mg arsenic/kg of diet, and the greatest concentrations of arsenic were found in liver tissue. The amounts of arsenic in dried liver tissue were 0.0, 3.1, 26.8, and 29.2 mg/kg for the dietary levels of 0, 27, 144, and 273 mg/kg, respectively. A 6-day withdrawal from arsenic feeding was sufficient to reduce all tissue arsenic to less than the FDA standard of 1 mg/kg fresh poultry tissue with the exception of lever from the sheep fed 273 mg arsenic/kg of diet. Lactating cows were fed rations containing dried poultry manure contaminated with polychlorinated biphenyls (PCB) mixtures containing 21 to 68% chlorine. The diets of the cows contained 0.30 to 0.99 mg/kg PCB and were fed for 35 to 45 days. Residues of mono- to pentalachlorophenyl were not detected but residues of hexa- to decachlorobiphenyls were found in milk at significant levels.

INVESTIGATOR: CECIL H C 1106-11210-001

LOCATION: AGRICULTURAL RESEARCH CENTER SMY: .2
BELTSVILLE MARYLAND

START DATE: 07 08 69

EFFECTS OF PESTICIDES, AGR CHEMICALS, ENVIRONMENTAL AND INDUSTRIAL POLLUTANTS (PCBS) ON FARM AND LA

OBJECTIVES:
Determine the biochemical and physiological effects of organochlorine pesticides (DDT, methoxychlor) and organochlorine pollutants (PCBs) on farm laboratory animals.

PROGRESS REPORT: 72/07 73/06
A comparison was made of the effects of different classes of pesticides on liver metabolism by the pentobarbital sleeping time assay. The duration of pentobarbital anesthesia is dependent upon metobolism of the drug by the liver. The organochlorine pesticides, DDT, methoxychlor and the organophosphate, melathion prolonged sleeping time while the carbamate, Sevin, had no effect. Another organophosphate pesticide, Abate, shortened sleeping times. Our results indicate that no general pattern of effects exists for pesticidal compounds even though they are of the same general structure and class. Changes in sheep and rat liver enzyme activities were measured after feeding DDT or methoxychlor. Liver enzyme activity of aminopyrine demethylase and aniline hydroxylase was 10 x higher in sheep than rat. Feeding 250 ppm DDT to sheep induces a 5-fold increase in demethylase activity and a 2-fold increase in hydroxylase activity; 250 to 2500 ppm methoxychlor feeding induced a 1.5-fold increase in both enzyme activities. Only DDT feeding increased enzyme activity in the rat.

INVESTIGATOR: DAVISON K L 3602-14280-006

LOCATION: NORTH DAKOTA STATE UNIV SMY: .7
FARGO NORTH DAKOTA
START DATE: 18 02 71

THE PHYSIOLOGY OF CHLORINATED HYDROCARBON INSECTICIDE METABOLISM IN LIVESTOCK

OBJECTIVES:
Determine the physiological kinetics of accumulation, excretion, and metabolism of chlorinated hydrocarbon insecticides by animals.

PROGRESS REPORT: 72/07 73/06
Two experiments to determine effects of DDT and dieldrin on egg production, shell thickness, fertility, and hatchability were conducted with ducks. Measurable thinning of eggshells did not occur when ducks were fed ad libitum diets containing 1 ppm of dieldrin or 2 ppm of either technical or p,p'-DDT. When 20 or 200 ppm of either technical or p,p'-DDT was fed, eggshells were thinned 10 and 20%, respectively. When 5 or 10 ppm of dieldrin was fed, eggshells were thinned 4 and 6%, respectively. The effects of DDT on eggshell thinning were confirmed in ducks housed individually and fed a fixed amount of feed. Egg production, fertility, and hatchability were not measurably affected by either DDT or dieldrin. Eggshells of control Japanese quail housed in pairs, male and female, were 5% thinner than those of quail housed individually. Eggshells of paired quail fed 40 ppm were 6 to 10% thinner than those paired controls. DDE fed at levels up to 200 ppm did not cause eggshell thinning of individually housed quail. p,p'-DDT fed at 2.5, 10, and 40 ppm did not cause eggshell thinning of individually housed quail. Eight metabolites of o,p'-DDT metabolism in the rat have been isolated, characterized, and the identification of most of these metabolites confirmed by synthesis. Comparison of the metabolism of o,p'-DDT in the rat and chicken indicates differences in that chickens produce o,p'-DDE, A HYDROXY-DEE, and a hydroxy-methoxy-DDE. These DDE metabolites were not identified in the excreta of rats.

INVESTIGATOR: SINGER R H 7302-11210-004

LOCATION: VET TOX & ENT RESEARCH LAB SMY: 3.9
COLLEGE STATION TEXAS
START DATE:

EFFECT OF NITRATES AND OTHER NITROGENOUS COMPOUND ON TOXICITY OF PESTICIDES

OBJECTIVES:
Determine the extent of potentiation or alteration of absorption, detoxification, and excretion of pesticides and other agricultural chemicals when they are combined with nitrogenous compounds, such as nitrates and ammonium salts, occurring in the diet of animals (from water pollution, forage, or the deliberate or accidental addition to feeds) and the consequent increase or reduction of the toxicity of each or of their reaction products.

PROGRESS REPORT: 72/07 73/06
The toxicity of ammonium sulfamate, a weed killer, widely used, was determined in sheep. Clinical signs were not observed with doses of 0.5 g/kg body weight. Clinical signs of poisoning consisting of anorexia and severe diarrhea were observed with doses of 1 g/kg that persisted for 48 to 72 hours, after which the animals fully recovered. Doses of 2 g/kg caused death in 5 to 10 days; doses of 3 g/kg caused death in 48 to 72 hours; and doses of 4 and 5 g/kg caused death within 24 to 48 hours. At doses of 2 g/kg upward, ammonium sulfamate caused severe acidosis and irreversible kidney damage. Clinical signs of poisoning always included anorexia and severe diarrhea. Blood ammonia levels did not increase sufficiently at any dose level to cause severe ammonia toxicity. The mode of action of ammonium sulfamate thus differs markedly from that of ammonium compounds previously studied.

INVESTIGATOR: PAULSON G D 3602-14280-008

LOCATION: NORTH DAKOTA STATE UNIV SMY: 1.2
FARGO NORTH DAKOTA
START DATE: 17 04 68

METABOLIC FATE OF AGRICULTURAL CHEMICALS IN POULTRY

OBJECTIVES:
Study the metabolism of carbamate pesticides in poultry by determination of the metabolic fate of the parent compound; isolation and identification of metabolites in urine, feces, body tissues and eggs; and determine if feeding the compound to the bird results in enzyme induction.

PROGRESS REPORT: 72/07 73/06
Chickens dosed with ring-labeled ^{14}C-MBR-8251 (4-phenylsulfonyl-trifluoro-methane sulfono-o-toluidide) excreted 22.1 and 45.5% of the administered radioactivity in the urine and feces, respectively, in a 48-hr collection period. The activity remaining in the carcass of the chicken 48 hr after dosing accounted for 18.7% of the carbon-14 given. Isolation and identification of the products of metabolism are in progress.

INVESTIGATOR: DRUMMOND R O 7305-14390-001

LOCATION: USDA LIVESTOCK INSECT LAB SMY: 2.2
KERRVILLE TEXAS
START DATE: 29 05 69

TOXICITY AND RESIDUES OF INSECTICIDES AND REPELLENTS IN LIVESTOCK AND POULTRY

OBJECTIVES:
Determine toxicity of insect control chemicals and other agents to livestock and poultry; establish the extent and persistence of residues in meat, milk, and eggs; develop methods that will minimize residues.

PROGRESS REPORT: 72/07 73/06
Zoecon compound ZR-515 was prepared by the company with a carbon 14 label. This material was then administered orally to a steer held in a metabolism stall. The waste product, blood samples and, at slaughter, tissue samples were analyzed to determine the total radioactivity. The chemical composition of the radioactivity was determined by using column chromatography with Amberlite XAD-2. Thin layer chromatography, extraction techniques, liquid scintillation counting, geiger counting, and autoradiography were used to determine the rate, total elimination, and metabolism of ZR-515 by the steer.

INVESTIGATOR: SMALLEY H E 7302-11210-005

LOCATION: VET POX & ENT RESEARCH LAB SMY: 3.6
COLLEGE STATION TEXAS
START DATE:

NEUROLOGICAL EFFECTS OF AGRICULTURAL CHEMICALS IN DOMESTIC ANIMALS

OBJECTIVES:
Determine mechanisms of transient and permanent toxic damage to both peripheral and central nervous systems due to exposure to toxic agricultural chemicals.

PROGRESS REPORT: 72/07 73/06
Viable neurons with inter-neuronal connections were produced both by explantation and cell culture. Juvenile hormone analogue R-20458 caused all cells save neurons to be removed from brain cell monolayers. Atropine sulfate

was effective only at 150 mg/kg in the guinea pig in contrast with approximately 0.01 mg/kg in the human. Plictran increased heart rate, decreased blood pressure, and increased the voltage of the QRS wave of Lead II of the electrocardiogram in sheep more than two-fold. Oxychlordane and its ketone photoisomer are quite toxic to mice; the epoxide isomer is of low toxicity. Preliminary studies of the neurological responses of sheep of Plictran and to Hymenoxys odorata have been made.

INVESTIGATOR: SIEGEL H S 7902-11210-001

LOCATION: USDA SE POULTRY RESEARCH LAB SMY: .5
ATHENS GEORGIA
START DATE: 10 01 72

PESTICIDE EFFECTS ON IMMUNE RESPONSES AND ADRENAL ACTIVITY

OBJECTIVES:
Determine the effects of chlorinated hydrocarbons, organophosphates and carbamates on the ability of chickens to form and maintain antibodies and relate these effects to adrenal corticosteroid synthesis.

PROGRESS REPORT: 72/07 73/06
Levels of from 0 to 2700 ppm of technical grade DDT were fed to young White Rock males over a 5-week period. After 2 weeks' feeding, the birds were inoculated intravenously with Salmonella pullorum (SP) or Bovine Serum Albumin (BSA) antigens. In 1 of 3 experiments at 6 days' post-antigen inoculation, agglutinin titers against SP antigen were significantly higher in birds fed 50 ppm DDT than in those fed 0 or 500 ppm. No other significant differences in titer were found. All birds fed 2700 ppm died within 12 days after feeding began. Despite outward signs of toxicity in birds fed 900 ppm, no significant depression of agglutinin response to SP antigen was observed. Analysis of adrenal, liver, and brain indicated that total DDT residue concentrations in the adrenal were approximately 5 times that of the liver and approximately 20 times that of the brain. The two major isomers detected in all three tissues were p,p'-DDE and p,p'-DDT. Lesser amounts of o,p'-DDT and p,p-DDD were also found.

INVESTIGATOR: IVEY M C 7305-14390-002

LOCATION: USDA LIVESTOCK INSECT LAB SMY: 1.1
KERRVILLE TEXAS
START DATE: 09 04 69

PESTICIDE RESIDUE ANALYSIS, KERRVILLE

OBJECTIVES:
Determine the amount, persistence, and fate of residues of new insect control chemicals in animals, milk, poultry, and eggs. Develop sensitive, accurate, specific methods of analysis for these pesticide residues and their breakdown products.

PROGRESS REPORT: 72/07 73/06
Residues of CIBA C-9491, its oxygen analog, and its photodecomposition product were determined for tissues of cattle sprayed once or 4 times with 0.5% C-9491 and once with 1.5%. Residues were found in fatty tissues. No residues were found after 5-7 weeks following spraying. Residues of ethion, ethion monooxon, and ethion dioxon were determined in tissues of turkeys confined on soil treated with 4 lb, 12 lb, and 40 lb ethion/acre. Maximum residues of ethion were found in fat and skin at 1 week posttreatment and decreased to < 0.002 ppm after 4-12 weeks. Ethion monooxon was found in turkeys confined on ground treated at the highest level, and no ethion dioxon was detected. Residues of ronnel and its oxygen analog are being determined in eggs and tissue of chickens sprayed once and twice (28 days later) with 0.5% ronnel.

INVESTIGATOR: DAVISON K L 3o02-14280-007

LOCATION: NORTH DAKOTA STATE UNIV SMY: 1.2
FARGO NORTH DAKOTA
START DATE: 18 02 71

INFLUENCE OF CHLORINATED HYDROCARBON INSECTICIDE METABOLISM ON LIVER MICROSOMAL ENZYME SYSTEMS IN AN

OBJECTIVES:
To study the effects of chlorinated hydrocarbon metabolism in animals on liver microsomal enzyme systems and these enzymatic systems on gonadotrophic steroid metabolism.

PROGRESS REPORT: 72/07 73/06
Cytochrome P(450) concentration was 3.2 and 2.8 OD units per 100 mg of protein in hepatic tissue of the goat and cow, respectively. These measurements were similar to those in hepatic tissue of "normal" chickens, rats, Japanese quail, and mallard ducks. Dieldrin and DDT cause the concentration of cytochrome P(450) to increase markedly in hepatic microsomes of chickens, quail, rats, and ducks. Aniline hydroxylase and aminopyrine N-demethylase activities of microsomes from the goat were about 2X those of the cow. These activities in microsomes from rats and ducks were about equal to those in microsomes from the cow. Hydroxylase and N-demethylase activities in chickens were about 3X, and those in quail were about 4X those of the cow. When DDT was fed at 100 or 200 ppm, aniline hydroxylase activity of hepatic microsomes from chickens or quail was depressed, but activity was increased for ducks. In vitro additions of DDT competitively inhibited aniline hydroxylase activity of chicken and quail microsomes, but did not inhibit activity of duck or cow microsomes. Microsomal preparations from chickens and quail fed DDT contained sufficient DDT and DDE residues for competitive inhibition to be a possible explanation of the reduced aniline hydroxylase activity. The predominant residue in microsomes from ducks fed DDT was DDD. These observations reveal some species differences at the cellular level in the metabolism of DDT and possibly in the metabolism of other chemicals--either natural chemicals or xenobiotics.

MARKETING

INVESTIGATOR: CHILDS R E TF2-115A

LOCATION: P O BOX 5o77 SMY: .1
ATHENS GEORGIA
START DATE: 20 02 68

IMPROVED EQUIPMENT AND OPERATING METHODS FOR POULTRY PROCESSING TO REDUCE WATER REQUIREMENTS

OBJECTIVES:
Reduce quantity of water being used to process poultry through equipment and process modifications and redesign facilities to permit water reuse where potable quality is not required.

PROGRESS REPORT: 67/07 73/06
Surveys were made and instrumentation installed to determine water use rates in poultry processing operations. Microbial studies were made to determine effectiveness of poultry carcass washers. A final bird washer was designed, constructed, and successfully tested that significantly reduced the amount of water required for washing poultry carcasses. The experimental washer provided a means for determining design and operating specifications, including nozzle type and size, nozzle position, and water pressure for best overall results. Water samples were taken from poultry chillers in 5 processing plants and

laboratory analysis found amounts of fat, total solids, suspended solids, dissolved solids, B.O.D. levels and other characteristics. Screen sizes were determined for removing undissolved solids.

INVESTIGATOR: BRANT A W 0701-13751-001-A

LOCATION: UNIV OF CALIFORNIA
DAVIS CALIFORNIA

SMY: .4

START DATE: 18 06 73

DEVELOP DESIGN STANDARDS FOR POULTRY PROCESSING EQUIPMENT

OBJECTIVES:
Develop design standards for poultry processing equipment.

INVESTIGATOR: HEATH J L 1090-15861-002-A

LOCATION: UNIV OF MARYLAND
COLLEGE PARK MARYLAND

SMY: .0

START DATE: 23 10 73

DEVELOP FACILITY MODIFICATIONS IN POULTRY PROCESSING PLANTS TO MEET NOISE LEVEL STANDARDS

OBJECTIVES:
Develop facility modifications in poultry processing plants to meet noise level standards.

INVESTIGATOR: HAMANN J A 1104-15862-005

LOCATION: FEDERAL CENTER BUILDING
HYATTSVILLE MARYLAND

SMY: .2

START DATE: 08 04 68

IMPROVED POULTRY AND POULTRY PRODUCTS, PROCESSING PLANT EFFICIENCY AND INVESTIGATION LEADERSHIP

OBJECTIVES:
Provide program leadership; improve poultry products processing facilities and work methods to reduce labor requirements and facilities costs while reducing hazards to product quality.

PROGRESS REPORT: 72/07 73/06
Conducted tests on fowl boning equipment developed cooperatively with the University of California. Breast meat removal component modified. Improved layouts and operating methods recommendations prepared for dairy and poultry products processing plants in Wisconsin, Tennessee, and Virginia were reviewed with staff researchers. Developed recommendations for Secretary of Agriculture Egg Marketing Task Force. Reviewed progress reports for processing plant design studies and reports on completed research on improving turkey boning and eviscerating operations. Developed cooperative agreement with University of California for joint development of design standards (P3A) for poultry processing equipment.

INVESTIGATOR: WALKER D R

TF2-113A

LOCATION: UNIV OF CALIFORNIA
DAVIS CALIFORNIA

SMY: .4

START DATE: 13 02 68

IMPROVED MEETHODS, TECHNIQUES, AND EQUIPMENT FOR COMMERCIAL EGG GRADING AND PACKING PLANTS

OBJECTIVES:
Determine stress and shock factors during egg handling and processing operations in commercial plants that cause egg breakage and prepare guidelines for developing improvements in handling methods and equipment design that reduce breakage.

PROGRESS REPORT: 68/02 73/12
Localized stress valves were found to be in the range of 4000 to 5000 psi in compression in the long axis if the egg, and less in the perpendicular axis. The thermal coefficient of expansion for eggshell had a negative value near -2.425×10^{-6} in./in.$^{\circ}$F. The maximum thermal stress at the waist of the egg (115°F in H(2)O) was 552 psi. Calculated Poisson's ratio was 0.307. Flexural rigidity, determined as a function of effective shell thickness, was in the range of 5×10^{6} to 12.5×10^{6} psi, with inward and outward loading. Ultimate tensile strength ranged from outside load of 5000 to 8000 psi and inside load of 8500 to 14,000 psi. Redisual stress as well as egg size was found to be significant. A compact radio transmitter and transducer system was designed and placed in a plastic egg similar to a hens egg. Points of high impact were determined with this electronic egg and recording system; they were at the loader, transfer from conveyor to conveyor, at the weighing station, egg against egg collisions, and during the drop into the carton. Of breakage in the processing plant 29% was due to machine handling. Also a free fall impact of less than 1/2 inch against a solid object, such as a steel plate, caused normal egg shells to crack. This was found comparable to egg against egg impact.

INVESTIGATOR: CHILDS R E

TF2-116A

LOCATION: P O BOX 5677
ATHENS GEORGIA

SMY: .8

START DATE: 13 02 68

IMPROVED EQUIPMENT AND TECHNIQUES FOR SLAUGHTERING AND DEFEATHERING CHICKENS IN COMMERCIAL PLANTS

OBJECTIVES:
Develop chicken slaughtering and defeathering techniques and equipment that decrease the labor requirements while reducing spoilage hazards and damage to the carcass quality.

PROGRESS REPORT: 67/07 73/06
Conventional methods and equipment for slaughtering, scalding, and defeathering chickens in commercial processing plants were evaluated relative to electrical pre-slaughter and post slaughter stunning, slaughtering devices, blood collection and disposal, scald water temperatures, picking machines and their effect on carcass damage and feather disposal. Research was undertaken that established proper electrical settings to facilitate blood and feather release and determined the physiological effects of electric shock on carcass quality. A blood handling system was developed that automatically collects and disposes of the blood, thus drastically reducing BOD loading of plant effluent and labor requirements for plant clean-up.

INVESTIGATOR: LEDERER B E 1104-15864-002

LOCATION: USDA-ARS-ARC-E SMY: .0
BELTSVILLE MARYLAND
START DATE: 13 11 73

DETERMINE COSTS FOR DIFFERENT SYSTEMS OF MARKETING SHELL EGGS FROM PACKING PLANT TO RETAIL STORE

OBJECTIVES:
Analyze two major systems of marketing shell eggs from packing plant to retail store (direct to store and warehouse to store) including the handling methods and equipment used, damage incurred, and costs involved.

INVESTIGATOR: WHITEHEAD W K 7902-15790-006

LOCATION: P O BOX 5677 SMY: .0
ATHENS GEORGIA
START DATE: 15 01 74

INCREASED EFFICIENCY IN POULTRY PROCESSING PLANTS THROUGH IMPROVED WATER UTILIZATION

OBJECTIVES:
Minimize the amount of water used for processing poultry while maintaining sanitary plant conditions by improving or changing processing methods and equipment to provide more effective use and increased reuse of the water.

INVESTIGATOR: CHILDS R E 7902-15790-005

LOCATION: PO BOX 5677 SMY: 1.0
ATHENS GEORGIA
START DATE: 12 05 70

IMPROVED METHODS AND EQUIPMENT FOR HANDLING LIVE CHICKENS BY COMMERCIAL PROCESSING PLANTS

OBJECTIVES:
Design work methods and equipment for loading and unloading live chickens that reduce labor requirements and minimize bruise damage.

PROGRESS REPORT: 72/07 73/06
Two more components of an overall chicken coop handling system were developed and tested during the reporting period. A device for lifting four stacks of coops at a time from a truck was constructed and tested. This unit was designed to be used in conjunction with the coop destacker developed last FY (72). Also, a coop re-stacker was designed, constructed, and tested this FY. It re-stacks empty chicken coops for loading back onto the live haul trucks. Patent applications have been filed for all units. One other system component under construction is a coop cleaning and sanitizing system. Arrangements were made with a processor to install the first 3 units (stack lifter, coop de-stacker, and coop re-stacker) in a commercial operation to evaluate their performance, manpower requirements, and operating costs under commercial conditions. Patent applications have been filed for de-stacker and stack lifter.

INVESTIGATOR: LILLARD H S 7902-15980-002

LOCATION: RICHARD B RUSSELL AGR RES CENT SMY: 1.6
ATHENS GEORGIA
START DATE: 03 06 70

PRESENCE AND SURVIVAL OF CLOSTRIDIA AND STAPHYLOCOCCI IN FURTHER PROCESSED POULTRY.

OBJECTIVES:
Survey microbiological conditions in poultry processing plants in the Southeast and determine the effectiveness of processing techniques on survival of clostridia and coagulase positive staphylococci in further processed poultry products.

PROGRESS REPORT: 72/07 73/06
Because water scalding of poultry by submersion results in internal contamination of the carcass, a microbiological evaluation was made of an alternate scalding method in which steam at sub-atmospheric pressure was used. Results showed that microbiological contamination of the carcass is significantly lower when broilers are scalded by steam at sub-atmospheric pressure rather than by submersion. Preliminary work was started on the feasibility of marketing fried chicken at refrigeration temperatures using chicken innoculated with C perfringens cells and spores in chicken.

INVESTIGATOR: SANDERS D H FC-122

LOCATION: UNIV OF GEORGIA SMY: .6
ATHENS GEORGIA
START DATE: 28 03 68

IMPROVING MICROBIOLOGICAL CONDITION OF EVISCERATED BROILERS

OBJECTIVES:
Develop practical methods for reducing numbers of microorganisms in eviscerated broiler carcasses causing spoilage and affecting the public health.

PROGRESS REPORT: 68/03 72/03
Water penetration into chicken carcasses during chilling, measured with a dye tracer, was primarily through feather follicles and tissues near evisceration cuts. High agitation promoted penetration. Infrared spectrophotometric measurement of solvent swabbings of chicken carcass skin showed change patterns related to microbial growth during storage. Spray washing of carcasses, before chilling, with 40-50 ppm chlorine significantly reduced microbial counts, as compared to washing with no chlorine or lower chlorine levels. Higher chlorine levels, up to 230 ppm, did not significantly reduce counts below counts at 40-50 ppm level.

INVESTIGATOR: THOMSON J E FC-178

LOCATION: PLANT INDUSTRY STATION SMY: .4
BELTSVILLE MARYLAND
START DATE: 15 12 70

CONTROL OF CLOSTRIDIA IN PACKAGED CHILLED POULTRY

OBJECTIVES:
Develop identification and control methods for food-poisoning clostridia in packaged chilled poultry products.

PROGRESS REPORT: 70/12 73/02
Polyethylene and vinylidene film for packaging fryers were compared by storage at 2° C. Aerobic bacteria and pseudomonad counts were greater in polyethylene than in vinylidene. Lactobacilli counts were not affected by type of packaging. Microbacterium thermosphactum counts were higher in polyethylene than in vacuumized vinylidene, but not different without vacuum. Clostridium perfringens counts did not show consistent relationships. Use of vacuum reduced rancidity development.

INVESTIGATOR: LINEWEAVER H W6-1-77

LOCATION: USDA 800 BUCHANAN STREET SMY: .3
ALBANY CALIFORNIA
START DATE: 10 06 68

PROCESSING FACTORS AND PRODUCT CHARACTERISTICS AFFECTING PASTEURIZATION OF POULTRY MEAT

OBJECTIVES:
Evaluate processing and product factors critical to pasteurization of poultry meat.

PROGRESS REPORT: 68/06 73/06
This work unit was approved in June 1968 for a three-year period and then extended for a two-year period to expire in June 1973. The major objective was to find new ways to reduce the occurrence of, or to destroy, salmonellae that occur occasionally on poultry meat. The pasteurization treatment involving the condensation of steam at reduced pressure was found to be an effective way of pasteurizing the surface. It was further found that steam at reduced pressure could be used to efficiently and effectively scald poultry for feather removal, thus avoiding the contaminated scald tank now used. It was for the latter reason that the project was extended for the two-year period. The project is being terminated because the evaluation of sub-atmospheric steam scalding for pasteurization has been completed and also because the proof that sub-atmospheric steam scalding can be used for feather removal has been completed. Commerical procedures based on these laboratory findings have not yet been developed.

INVESTIGATOR: MERCURI A J FC-39

LOCATION: PLANT INDUSTRY STATION SMY: .0
BELTSVILLE MARYLAND
START DATE: 12 01 67

CONTROL OF SALMONELLA ON FRESH MARKET POULTRY

OBJECTIVES:
Develop practical methods for elimination of salmonellae on fresh market poultry.

PROGRESS REPORT: 67/01 72/05
Citric acid, succinic acid, beta-propiolactone, chlortetracycline, neomycin or chlorine at 20 ppm were not effective in reducing salmonellae. A 100 or 200 ppm chlorine spray, or washing carcasses after chilling, lowered incidence of salmonellae. Salmonellae were not inhibited by treatment with a photosenitizing compound, then exposure to "daylight" lamps.

INVESTIGATOR: PALMER H H W6-1-78

LOCATION: USDA 800 BUCHANAN STREET SMY: 3.6
ALBANY CALIFORNIA
START DATE: 02 10 68

DETERMINATION OF UPPER LIMITS FOR PRACTICAL PASTEURIZATION OF EGG PRODUCTS

OBJECTIVES:
Determine time-temperature conditions and equipment design for egg product pasteurization for maximum destruction of Salmonella and minimum loss of functional performance of products.

PROGRESS REPORT: 68/10 73/07
Thermal death rate data were determined for salmonella in various egg products, with and without additives. These data were used to determine regulatory standards for pasteurizing egg products with maximum destruction of salmonella, while retaining maximum functional performance. An egg pasteurization manual was published for use by processors and regulatory agencies. Numbers of salmonella occurring in unpasteurized egg products were determined in freshly broken out egg meats in a number of commercial processing plants. Failures in egg pasteurization can occur when leaks develop between raw and pasteurized sides of regeneration sections. Methods developed to detect and locate these leaks have been adopted and are now routinely used by plant inspectors. Pasteurizing 10% salt yolks presents great problems because of the very high viscosity and resultant pressures. Research showed that it is safe to by-pass the cooling section by packing these products warm, and then placing them directly in to the freezer. The viscosity of egg products causes them to be in partial laminar flow in the holding tubes of pasteurizers. Since runs are always started on water and finished with water, large volumes of egg products are diluted and consequently find their way into waste water streams. A slug-flow holder was developed that can eliminate these losses, insure complete pasteurization and yield a more uniformly treated product.

INVESTIGATOR: LITTLEFIELD L H 1209-11520-002

LOCATION: UNIVERSITY OF DELAWARE SMY: .6
GEORGETOWN DELAWARE
START DATE: 29 10 71

EFFECTS OF DIETARY FAT ON PRODUCT QUALITY IN BROILERS

OBJECTIVES:
Ic improve the types and levels of lipids in broilers by various production methods.

PROGRESS REPORT: 72/07 73/06
A study was conducted to determine the effect of growing systems upon the carcass characteristics of six commercial broiler strains. In each of 2 trials, 14 birds of each strain, 7 males and 7 females, were raised on the floor and in coops. At eight weeks of age the birds were New York dressed in a commercial plant and returned to the laboratory for weighing. The abdominal adipose tissue from each bird was removed and weighed prior to evisceration. After chilling, the carcasses were iced down, stored for 48 hours and skinned. The skin weights included the wing tips, coccygeal region, and subcutaneous fat deposits. The results were reported as percent abdominal fat of live weight, percent abdominal fat of processed weight and percent skin of processed weight. Differences in the percent fat of live weight and processed weight between strains were significant for cockerels raised on the floor and in coops. The percent skin for cockerels and pullets on the floor and for pullets in the coops were signficantly different between strains. Since these differences were not identical in both trials a seasonal effect may be involved.

INVESTIGATOR: PALMER H H 5102-15790-001

LOCATION: 800 BUCHANAN STREET SMY: 4.2
BERKELEY CALIFORNIA
START DATE: 03 09 71

DEVELOPMENT OF ECONOMICAL, NEW, AND IMPROVED TURKEY MEAT PRODUCTS.

OBJECTIVES:
To increase the use of turkeys by providing more convenient products better suited to consumption in smaller units, and more economical, nutritious products based on mechanically-deboned fresh turkey meat.

PROGRESS REPORT: 72/07 73/06
Sensory and chemical tests have shown that coarse ground turkey packed in polyethylene or similar tubing remains stable for at least four months at 10°, 0°, or -30° F. Ground turkey prepared from fresh birds was not distinguishable in these tests from that prepared from birds that had been in storage for six to ten months at 0° F. prior to boning. The tests included products from two sources, and mixtures of dark meat, skin, and light meat. Because of certain specification requirements for preparing precooked food, the military has requested that we devise an objective test to determine whether raw animal muscle has been frozen. Preliminary studies indicate that the tendency for some enzymes to be solubilized by freezing may provide a basis for such a test. Turkeys fed diets containing varying levels of fish oil and safflower oil, from hatch to eight weeks of age, were found to be fishy tasting in proportion to the amount of fish oil in the diet. Fishiness had not been found at six weeks of age in earlier studies. Some levels of fish oil in the diets were supplemented with macro amounts of alpha-tocopherol. Turkeys fed these diets were consistently less fishy than those fed the same level of fish oil without alpha-tocopherol supplementation. Turkeys fed diets containing varying levels of fish oil for a two-week period (from 14 to 16 weeks of age) were fishy in direct relation to the level of fish oil in the diet.

INVESTIGATOR: DONOVAN J W 5102-15800-001

LOCATION: 800 BUCHANAN STREET SMY: 5.0
BERKELEY CALIFORNIA
START DATE: 04 02 71

CHANGES IN EGG PROTEINS AFFECTING THE USE OF EGG PRODUCTS

OBJECTIVES:
Determine the nature of the changes in egg proteins produced by processing or storage which adversely affect use or properties of egg products. Devise methods to eliminate or compensate for these changes.

PROGRESS REPORT: 72/07 73/06
Differential scanning calorimetry (DSC) shows that alterations in egg white produced by processing can be defined in terms of denaturation of specific proteins. The degree of stabilization of egg white by additives such as sucrose or metal ions has been determined. The amount of S-ovalbumin formed upon storage of eggs for controlled times and temperature can be calculated from the DSC trace, and is a quantitative measure of egg quality. DSC studies reveal that the two metal-binding sites of conalbumin are not equivalent, a fact that has been sought unsuccessfully in other laboratories for 10 years. The heat stability of proteinases in the presence and absence of inhibitors has also been studied by DSC. This has led to the development of a method of preparation of beta-trypsin. A key step in this preparation is the use of ovoinhibitor-agarose gel. Four pre-cooked frozen egg products have been developed for use in breakfast menus at Air Force Missile sites: French toast, puffy omelet (plain or with Spanish or cheese sauces), creamed egg and turkey on toast, and Western

or Denver egg. Problems or thawing and reheating these products in microwave and in air convection ovens without adverse effects on texture and flavor have been overcome by formulation and heating adjustments. Informal tests of acceptability have been favorable.

INVESTIGATOR: LITTLEFIELD L H 1209-11520-001

LOCATION: UNIVERSITY OF DELAWARE SMY: 1.2
GEORGETOWN DELAWARE

START DATE: 30 04 69

PRODUCTION FACTORS AFFECTING POULTRY MEAT QUALITY

OBJECTIVES:
Reduce losses in broilers caused by breast blisters and other defects.

PROGRESS REPORT: 72/07 73/06
Broiler-type cockerels fed corn-soy diets, or corn-soy + 6% fish meal were cooked in nylon or foil. Taste panel results showed that regardless of the dietary treatment the cooking loss was greater in nylon bags than in foil. Flavor and moisture differences were found to be significant in both light and dark meat.

INVESTIGATOR: KOTULA A W 1104-15851-004

LOCATION: RM 227 ADM BLDG ARC-WEST SMY: .2
BELTSVILLE MARYLAND

START DATE: 31 01 73

UNDESIRABLE INCLUSIONS INTRINSIC TO ANIMAL PRODUCTS

OBJECTIVES:
Develop tests for determining undesirable inclusions in meat.

PROGRESS REPORT: 72/07 73/06
No progress to report this period.

INVESTIGATOR: SHUPE W L TF2-155A

LOCATION: AGRIC EXPT FIELD STATION SMY: .6
DAVIS CALIFORNIA

START DATE: 05 02 70

IMPROVED METHODS, EQUIPMENT AND FACILITIES FOR CUTTING-UP AND DEBONING FOWL

OBJECTIVES:
Reduce labor requirements and increase meat yield in commercial fowl deboning operations.

PROGRESS REPORT: 70/02 73/12
A report was published giving results of increased labor utilization using time and motion study and Method Time Measurement (MTM), along with design and layout of a new system to debone turkey. A report was published giving results of increased labor utilization and most effecient rate of eviscerating turkeys. A report has been written with layout drawings covering efficient space utilization, equipment and work area layout, expansion of operation with minimum down time or major structural alterations, and some current considerations of regulations regarding OSHA, EPA, and personnel hazards. A fowl deboning machine

was designed, built, and tested with resulting mechanical removal of the wings, drumsticks, thighs, breast meat, and the carcass from a shackle device on a conveyor. Test data are being accumulated and tabulated and a report started.

INVESTIGATOR: ASHBY B H 1104-15841-002

LOCATION: FEDERAL CENTER BUILDING SMY: .7
HYATTSVILLE MARYLAND
START DATE: 23 03 70

STANDARDIZATION OF SHIPPING CONTAINERS FOR MEAT AND MEAT PRODUCTS

OBJECTIVES:
Improve the efficiency of marketing meats by determining requirements for standardizing shipping containers for meat and meat products.

PROGRESS REPORT: 72/07 73/06
Data were collected at four chainstore distribution warehouses on shipping containers used for meats and meat products and to identify specific problem areas associated with packaging, handling and distribution of meats. A multiplicity of container types and sizes were found to be used. Much of the container damage observed appeared to be a result of the many sizes of containers that prevented the use of proper stacking methods. Many of the various sizes of shipping containers could not be handled efficiently on the 48-by 40-inch pallet used in the warehouses. Potential container sizes were developed which could be substituted for the numerous container sizes used.

INVESTIGATOR: GARIBALDI J A 5102-15980-002

LOCATION: 800 BUCHANAN STREET SMY: 1.3
BERKELEY CALIFORNIA
START DATE: 05 11 69

EFFECT OF EGG AND POULTRY COMPONENTS ON GROWTH, DEATH, AND METABOLISM OF BACTERIA

OBJECTIVES:
Provide new information on the growth, survival and death rates of pathogens and spoilage microorganisms in the environment presented by raw, cooked and processed egg products.

PROGRESS REPORT: 72/07 73/06
Effect of temperature on biosynthesis of catechol types of iron transport compounds (ITC), as shown for Salmonella typhimurium Tm-1 was examined with several other salmonellae. These compounds are a strict growth requirement for salmonella under nutritional conditions limiting to iron and so must either be synthesized by the bacteria or be provided for growth. All 19 strains tested behaved similar to S.t. Tm-1, synthesizing much more ITC at 29° C. than at 35° C.; many were unable to synthesize ITC at 40.4° C. Of special interest were results with two strains of S.t., one virulent, the other avirulent for mice. The virulent strain biosynthesized cathecol ITC at 29°, 35°, and 40.4° C., although the yield decreased as temperature increased. The avirulent strain synthesized ITC at both 29 and 35° C., (less at 35° C.), but not at all at 40.4° C. Fourteen strains of Arizona hinshawii, a pathogen of special significance to turkeys, were tested under conditions conducive for ITC bionsynthesis. All strains produced ITC of both the catechol and hydroxamate type. The catechol type was isolated and purified and shown to be identical to that produced by salmonella (trimer of 2,3-di-OH benzoyl serine). The hydroxamate type has been purified and is under study.

INVESTIGATOR: SACKS L E 5102-15980-004

LOCATION: 800 BUCHANAN STREET SMY: 1.3
BERKELEY CALIFORNIA
START DATE: 11 11 71

PREPARATION OF PURIFIED SPORES, AND ANTISERA, OF CLOSTRIDIUM PERFRINGENS

OBJECTIVES:
To prepare clean spores of several type strains of C. perfringens, aiding the detection of these organisms in foods.

PROGRESS REPORT: 72/07 73/06
A superior sporulation medium for Clostridium perfringens has been developed. Heat-resistant spores of strains PS49-B, PS52-D, and ATCC 3629-D have been obtained in yields exceeding 10^7/ml in a clear, liquid medium. The basic ingredients of the medium are Trypticase, starch, bicarbonate, and buffer. In the presence of suitable carbohydrate energy sources, pH control becomes critical, and diethylbarbiturate and N-tris (hydroxymethyl) methyl-2-aminoethane sulfonic acid have been employed to increase buffer capacity, thus avoiding the deleterious effects induced by excess phosphate. Lower spore yields have been obtained with strain KA3-A, and the medium is being modified to achieve higher spore yields with this strain. Encouraging results have been obtained in the use of sodium dodecyl sulfate to remove the sporangium. An anaerobic screw-cap culture tube has been developed. These self-contained anaerobic test-tubes conveniently permit sampling and density determination on individual tubes, impossible when tubes are held in anaerobic jars.

INVESTIGATOR: KLOSE A A 7902-15790-002

LOCATION: RICHARD B RUSSELL AGR RES CENT SMY: 3.5
ATHENS GEORGIA
START DATE: 27 07 71

IMPROVE FLAVOR AND TEXTURE OF BROILER PRODUCTS THROUGH PROCESS MODIFICATION

OBJECTIVES:
Determine the physical and chemical properties of broilers as they relate to processing treatment and enhance product quality through process modification.

PROGRESS REPORT: 72/07 73/06
By development of trained sensory panels, subjective criteria for doneness in broiler thighs cooked in water were established. Scoring was based on residual red color in innermost flesh and artery of the thigh. Scores were well correlated with objective measurements of red color. Chicken actomyosin is easily denatured by heat. This precludes heat pasteurization for wholesomeness if meat is used later in sausage products. Stabilization of actomyosin against heat damage (measured as loss of emulsifying capacity) was accomplished either by elevating pH above 8.5, by increasing potassium chloride concentration to 0.6 Molal, or by addition of 0.6% Kena, a polyphosphate mixture. A specific sulfur detector, coupled to gas liquid chromatography equipment, was applied to analysis of cooked poultry aroma. Eight sulfur compounds, previously unidentified in cooked poultry, were demonstrated tentatively; these included mercaptans, sulfides, disulfides, and cyclic sulfur compounds. Some molecular sieves (adsorbents selective for a range of molecular sizes) were able to absorb all aroma-contributing compounds from cooked chicken volatiles, and subsequently release specific odor fractions on heating. The feasibility of cooking poultry in steam at selected subatmospheric pressures was demonstrated. Advantages include rapid, accurate temperature control, no over-heating or extraction of solubles, and high conductivity at surfaces.

INVESTIGATOR: CHILDS R E 7902-15790-001

LOCATION: P O BOX 5677 SMY: .1
ATHENS GEORGIA
START DATE: 09 10 70

E

OBJECTIVES:
Develop improved methods and equipment for cutting up broilers to reduce labor requirements and hazards to quality while maintaining costs of equipment at a level that will make mechanization economically feasible.

PROGRESS REPORT: 71/07 72/06
Prior to the initiation of this project the customary ways of cutting up and dismembering poultry carcasses were the butcher knife, single blade rotary knife, and band saw. All of these methods were hazardous to the employee, and especially the powered rotary blade and band saw, in that the hands were used to push the carcass past the blade for each cut. Under the project research program, novel and more efficient machines were designed and developed for cutting up poultry that were safe for the operator to use. A spiked-tooth chain is used in conjunction with guide bars to grasp, hold, position, and convey the carcass through the machine past a plurality of rotary knives that segment the carcass into parts accurately and at a rapid rate. The various cutting principles developed are combined into each machine to perform the cutting operations desired by each processor. Such operations can be performed as: cutting wings off, splitting carcass in half, cutting breast into three portions, removing drumsticks, and ripping out the vertebrae. Over 100 of these machines are presently used by the poultry industry with significant savings in labor and increases in productivity.

INVESTIGATOR: HUDSPETH J P 7902-15790-003

LOCATION: RICHARD B RUSSELL AGR RES CENT SMY: 1.6
ATHENS GEORGIA
START DATE: 12 04 72

IMPROVED TECHNOLOGY IN FURTHER PROCESSING OF BROILER MEAT PRODUCTS AND BYPRODUCTS

OBJECTIVES:
Develop technology for the complete recovery and optimum utilization in foods of all parts of the broiler carcass.

PROGRESS REPORT: 72/07 73/06
Broiler carcasses ranging in weight from about one to four lbs. were individually tagged and pieces cut by one of eight commercial cutting techniques. The parts were then frozen, thawed, water-cooked; and cooked yield, percent meat, skin and bone determined. Percentage of bone ranged from 43.5% for joint cut wing to 3.4% for wishbone portion of breast. A total of seven types of samples were assayed (comminuted meat, composite, skin, light meat, dark meat, ligaments, and bone) for moisture, fat, total nitrogen, hydroxyproline, ash, and calcium. Data from these assays indicated trends as currently outlined in the literature for these constituents. Composite and meat from mechanical deboners demonstrated rather high fat contents in these products. The percentage of collagen as measured by hydroxyproline content varied depending upon complexity of the raw materials: i.e., as to whether pure tissue was used or a complex mixture such as the bone composite. This information can now be employed to design a more complete experiment with emphasis upon the collagen content of machine deboned meat.

INVESTIGATOR: MERCURI A J 7902-15980-001

LOCATION: RICHARD B RUSSELL AGR RES CENT SMY: 2.6
ATHENS GEORGIA
START DATE: 05 03 73

CONTROL OF SALMONELLA IN BROILER PRODUCTS

OBJECTIVES:
Develop new and improved processing treatments for reducing or eliminating pathogenic microorganisms (primarily Salmonella) in broiler products.

PROGRESS REPORT: 72/07 73/06
Hind quarters (thigh and drumstick) of freshly processed broilers were immersed into an unheated or heated (60°C) succinic acid solution (1,3, or 5%) for one or three minutes, followed by a one-minute immersion in unheated or heated (60°C) tap water. When unheated succinic acid was used, the mean log reductions in total aerobic count for the 1, 3, and 5% solutions were 0.25, 0.42, and 0.78, respectively, whereas when heated succinic acid was used, the mean log reductions were 0.64, 1.11 and 1.20, respectively. Shelf life of the hot acid-treated hind quarters was extended up to 6 days at 4.4°C storage. Pseudomonas was the predominant type (about 80%) at the time of spoilage on both untreated and acid-treated samples. The use of succinic acid for the destruction of Salmonella on poultry meat was also studied. Immersion of thighs in a 3% succinic acid solution at 60°C resulted in some destruction of Salmonella montevideo (200 cells inoculated per hind quarter), but an 85°C acid treatment was needed to achieve elimination.

GENETICS

INVESTIGATOR: CRITTENDEN L B 1106-11160-003

LOCATION: AGRICULTURAL RESEARCH CNTR-EAS SMY: .9
BELTSVILLE MARYLAND
START DATE: 17 04 68

GENETICS OF AVIAN CELLS IN CULTURE

OBJECTIVES:
Define genes controlling resistance to leukosis viruses. Define genes controlling expression of latent leukosis viruses. Determine the influence of these genes on the incidence of lymphoid leukosis.

PROGRESS REPORT: 72/07 73/06
Avian leukosis viruses of a new subgroup E are found to occur in flocks of chickens which were previously thought to be free of infection. These viruses are considered to be endogenous viruses of the chicken because they can be activated by chemical or physical means from most chicken cells. Sensitive assay procedures have been developed for RAV-0, the spontaneously occurring leukosis virus of this subgroup, using cell culture passage and virus assay for the viral DNA-directed RNA polymerase or group-specific antigen. Our data suggest that dominant genes of the host control the expression of this virus and that these genes are independent of genes controlling cellular susceptibility to exogenous viruses of this subgroup. Preliminary data suggest that RAV-0 may not play an important role in the occurrence of lymphoid leukosis. The assay methods developed can now be used to study the genetic control, prevalence and oncogenecity of RAV-0.

INVESTIGATOR: CRITTENDEN L B 1106-11160-002

LOCATION: AGRICULTURAL RESEARCH CENTER SMY: .0
BELTSVILLE MARYLAND
START DATE: 27 08 69

GENETIC BASIC FOR RESISTANCE TO THE AVIAN LEUKOSIS COMPLEX

OBJECTIVES:
Obtain basic information on the inheritance of and physiologic basis for resistance to the avian leukosis complex, so that methods of breeding resistant stocks may be improved.

PROGRESS REPORT: 72/07 73/06
The forth year of work on this project has been completed and summarized in the 18th Annual Report of the Northeastern Regional Poultry Breeding Project. Detailed progress is reported by individual stations of the Northeastern Region. The Project has been revised and will go into effect in FY-74. The revised project is concentrating on the physiological mechanisms involved in resistance to the avian leukosis complex using experimental material developed in the first phase of this project or available from other stations.

INVESTIGATOR: GARWOOD V A 29-033-311A-15-097

LOCATION: PURDUE UNIV SMY: 1.8
LAFAYETTE INDIANA
START DATE: 21 06 72

NATURE AND UTILIZATION OF GENETIC VARIATION INFLUENCING ECONOMIC TRAITS IN POULTRY

OBJECTIVES:
Increase our understanding of inheritance in poultry, including the causes of selection plateaus, selection limits, and genetic drift using technics of quantitative genetics, immunogenetics and cytogenetics; determine the relationship of selection technics, social adaptability and genotype x environment interaction to efficiency of improvement in meat and egg production; increase the efficiency and usefulness of control populations by research on maintainance procedures and methods of utilization in experiments.

PROGRESS REPORT: 68/07 73/06
Selection over 12 generations for part-record egg production based on sire-family records gave greater responses than did that on an index or individual records. Selection over two generations was found to be effective in the development of lines differing in age at sexual maturity. Within lines selected for high or low egg production it was found that shifting the criterion of selection to either body or egg size caused no loss in useful genes for egg production. Maternal effects were found to be largely responsible for variation in hatching speed which could be depressed to a greater extent by genes for large egg size than by those for small egg size. Social dominance differences between breeds were found to have large effects upon egg production. Selection for high egg production appears to favor those birds which are more socially dominant. Dwarf genes and selection were used as means of reducing adult body size. Both appeared to produce the same results regarding subsequent efficiency of production. Specific chromosomal translocations were developed thereby making possible studies concerning the role of specific chromosomes in economically important traits.

INVESTIGATOR: SCHAR R D 1106-11510-001

LOCATION: AGRICULTURAL RESEARCH CENTER SMY: 2.3
BELTSVILLE MARYLAND
START DATE: 17 04 68

EVALUATION OF POULTRY STOCKS THROUGH RANDOM SAMPLE TESTS

OBJECTIVES:
Evaluate the economic qualities of commercial chicken and turkey stocks.

PROGRESS REPORT: 72/07 73/06
Data covering egg production traits of economic importance were collected by the supervisors of the ten random sample egg production tests conducted in the United States and Canada during 1971-72. These data were submitted to the Poultry Improvement Staff for statistical analysis on the basis of range group ranking. They were then combined, by stocks, with the data obtained in the 1970-71 tests, and a two-year analysis was made. These data were collected from nearly 88,000 chickens and represented 48 different commercial stocks plus ten experimental stocks produced by 34 breeders. Observations from over 33,000 trait x stock x pen interactions were obtained. These represented 325 entries from poultry breeders in the United States, Canada, England, and Israel. These birds were tested under 21 different environments at the ten locations. Regressed means and 80 percent confidence limits were computed for each of 17 production traits for each stock under test. These statistical treatments were designed to reduce the influence of nongenetic variations. They allow predictions, reported as regressed means, of what the average performance would have been for all traits of each stock had each stock been tested at all locations each year. The confidence intervals were computed to permit reliable predictions to be made as to whether the difference in the performance of two stocks was significant. Approximately 13,000 copies of the 37 page report has been distributed on request to interested poultrymen, breeders, educators, and scientists in the United States and approximately 57 foreign countries.

INVESTIGATOR: OLSEN M W 29-011-310-21-019

LOCATION: AGRICULTURAL RESEARCH CENTER SMY: .3
BELTSVILLE MARYLAND
START DATE: 25 11 69

PARTHENOGENESIS IN EGGS OF DOMESTIC FOWL

OBJECTIVES:
Determine roles of genetic, viral and physiological factors in parthenogenetic reproduction, particularly in turkeys.

PROGRESS REPORT: 69/11 72/02
A new program of inbreeding in the parthenogenetic strain of Beltsville Small White turkey led to a marked increase in the incidence of parthenogenesis. Of several thousand eggs laid by virgin hens from the last generation raised at Beltsville, 48.1% showed parthenogenetic development, 23.5% contained formed embryos and 3.2% produced live poults. In order to insure propagation of the strain after termination of the project, some of the turkeys were donated to interested scientists at Pennsylvania State University and Virginia Polytechnic Institute. Earlier evidence that parthenogenetic development in turkeys is enhanced by fowl pox virus was supported by collaborative research with E. G. Buss at Penn State. Eggs from BSW turkeys vaccinated with fowl pox virus at Beltsville exhibited a high incidence of organized parthenogenetic development with the production of many formed embryos. Eggs from the same strain of turkeys given no vaccination and maintained in the "pox free" environment at Penn State showed only disorganized parthenogenetic development and no formation of true embryos. Studies employing a parthenogenetic line of turkeys heterozygous for bronze feathering established that meiotic segregation during parthenogenesis is normal.

INVESTIGATOR: STONE H A 29-001-211-23-083

LOCATION: MICHIGAN STATE UNIV SMY: .1
EAST LANSING MICHIGAN
START DATE: 17 04 68

SKIN GRAFTING IN THE RPRL INBREDS TO DEVELOP ISOHISTOGENIC SUBLINES

OBJECTIVES:
Develop specific isohistogenic sublines for the production of stock giving a uniform repeatable response to exposure to avian tumor viruses, and the production of stock within which tissue exchanges remain intact to facilitate various types of transplantation experiments.

PROGRESS REPORT: 72/07 73/03
Reciprocal wattle tissue grafts were made within and between sire family groups of RPRL inbred lines 100, 6(1), 6(3), 7(2), 15(1), 15(4) and 15(6). The results show that 6(1) was histocompatible while the other lines had rejection rates of 2-10% suggesting that additional genetic selection will be required to obtain complete histocompatibility. Termination of the project is pending. This will be replaced by an in-house service project. Specific goals have been to develop specific histocompatible lines within which tissue exchanges remain intact. This will facilitate various types of transplantation experiments.

INVESTIGATOR: GARWOOD V A 29-030-312-15-092

LOCATION: PURDUE UNIV SMY: .2
LAFAYETTE INDIANA
START DATE: 17 04 68

GENETIC AND PHENOTYPIC RESPONSES TO HEAT STRESS OF CHICK EMBRYOS

OBJECTIVES:
Determine whether resistance of the chick embryo to high or low heat stress is heritable and to what extent genetic resistance is correlated with economic traits.

PROGRESS REPORT: 68/10 73/06
Two lines of chickens were developed through embryonic selection for resistance to hyperthermia and two through selection for resistance to hypothermia on day 14 of incubation. Stress temperatures were chosen which effected 75 percent mortality. After several generations the effectiveness of such selection and the response on secondary traits were tested. No response to selection was found and the lines did not differ from a control for hatchability, age at sexual maturity, egg production, body weight and mortality in the growing and laying periods. Comparisons were made to determine the effect upon embryonic development of illuminating incubating eggs with fluroescent light. Embryos from illuminated eggs were significantly heavier than those from non-illuminated eggs from day 5 through day 14. Similar work was initiated to compare effects of brown vs white shelled eggs and purebred vs crossbred embryos. Embryonic and post-hatching development rates of lines differing by 48 hrs. in mean hatching time were compared. Embryos of the early hatching line were found to possess a faster growth rate which they maintained for two weeks after hatching than their counterparts of the late hatching line.

INVESTIGATOR: SARVELLA P 29-033-311A-21-136

LOCATION: AGRICULTURAL RESEARCH CENTER SMY: .0
BELTSVILLE MARYLAND
START DATE: 02 11 71

INTERSPECIFIC GENE TRANSFER IN AVIAN SPECIES

OBJECTIVES:
To determine whether genes can be transferred from one avian species to another. To examine how genes are expressed in hybrids.

PROGRESS REPORT: 70/02 73/06
Hybrids of chicken, pheasant, turkey and quail were examined for fertility. Chicken-pheasant hybrids were made by natural and artificial matings. Large hybrids were males as determined cytologically and small females. Testes ranged from immature to mature. PMS injections stimulated maturation. Spermatids were present in some large hybrids. Females had only immature ovaries. One triploid hybrid was ZZW with the female parent contributing 2 sets of chromosomes. The palatability and meat quality of these hybrids were acceptable to a meat panel. Chicken-turkey hybrids did not mature as far as the previous hybrid. Chicken-quail hybrids showed many abnormalities in the testes. Many cells appeared to be polyploid and were probably restitution nuclei resulting from bridge formation. A new hybrid, pheasant X quail was hand raised. Only embryos of the pheasant-quail cross were obtained. Large and small turkey-pheasant hybrids were male and female, reepsctively. Testes sections showed some spermatids. Selection for improved crossing ability and fertility might be promising in the chicken X pheasant and pheasant X turkey. Interspecific hybrids were also studied in 3 species of pheasant - Reeves, Ringneck, and Elliott. Male and female F(1) hybrids were obtained from the Reeves X Ringneck and Reeves X Elliott. Males were fertile and were backcrossed to the parents. Gene transfer can be accomplished on the intergeneric level.

INVESTIGATOR: SARVELLA P 29-011-310-21-137

LOCATION: AGRICULTURAL RESEARCH CENTER SMY: 1.3
BELTSVILLE MARYLAND
START DATE: 28 10 71

INFLUENCE OF CHROMOSOME NUMBER ON REPRODUCTION AND PARTHENOGENESIS IN POULTRY

OBJECTIVES:
To determine the influence of parthenogenesis on fertility and hatachability in chickens. To define the cytologic basis for parthenogenesis.

PROGRESS REPORT: 70/10 73/06
Cytological and histological studies of parthenogenesis in chickens and turkeys showed that parthenogenesis is the result of two events. The first is doubling of the chromosome number after the second meiotic division in oviduct eggs. At one day in the incubated chicken egg and two days in the turkeys there is an extreme fragmentation of the nuclei resulting from abnormal divisions and leading to lobbed nuclei, bridges, lagging chromosomes. The cells recover and appear diploid in the embryos after passing through this sieve period. Adult parthenogenetic chickens were obtained. Both triethylene melamine and gammairradiation given to adult males reduced sperm content. Fertility and hatchability of the eggs from hens mated to these birds was reduced. Teratological abnormalities were seen in embryos from these eggs. Two new hybrids, gold wiry and white leg scales, were obtained. Down color, adult feathers, and viability were affected. Injections of pregnant mares serum into these birds caused them to mature almost normally. Egg laying was induced in females.

INVESTIGATOR: MARKS H L 7902-16110-001

LOCATION: USDA SE POULTRY RESEARCH LAB SMY: .3
ATHENS GEORGIA
START DATE: 21 12 60

GENETIC ASPECTS OF SELECTION PLATEAUS IN JAPANESE QUAIL

OBJECTIVES:
Investigate the value of selection under adverse environments with subsequent shifts to normal environment to circumvent apparent selection limits of quantitative traits.

PROGRESS REPORT: 72/07 73/06
Four-week body weights of quail selected under different nutritional environments have continued to increase through 26 generations of selection. Mean body weights of P-line quail (28% protein diet) and T-line quail (20% protein + 0.2% thiouracil) were 98 and 73 grams heavier than their respective controls. These gains reflect an increase of 140-160% in body weights of selected lines above nonselected controls. Testing of selected lines under different environments continue to confirm the observation that selection for 4-week weight in the T-population under an environment containing thiouracil has resulted in an inherent ability for these birds to completely eliminate the growth depressing effect of thiouracil. Evaluation of P, T, and control quail on diets containing other goitrogenic compounds suggest that the resistance to thiouracil stress in the T-line may be due to a threshold change and that T-line quail while not totally resistant, have a greater tolerance to the growth depressing effects of other goitrogenic compounds. When subjected to high temperature stress of 44-46°C., quail from the T-line were found to be as susceptible to heat stress as quail from the P-line. Selected lines (P and T) were observed to be less tolerant to high temperature stress than nonselected controls.

INVESTIGATOR: MARKS H L 7902-16110-003

LOCATION: USDA SE POULTRY RESEARCH LAB SMY: .3
ATHENS GEORGIA
START DATE: 03 02 69

ENVIRONMENT INFLUENCING GENETIC VARIABILITY AND EVALUATION OF POULTRY POPULATIONS

OBJECTIVES:
Evaluate specific genotype by environment interactions utilizing closed populations. Evaluate specific control populations utilized for measuring genetic and environmental change over time.

PROGRESS REPORT: 68/07 74/02
Six populations of chickens developed under different selection systems at experiment stations in the Southern region were evaluated at seven state experiment station locations. Correlations between phenotypes for the same genotype expressed in two different environments ranged from .96 to .99 indicating that interactions for eight-week body weight are of minor importance. These data confirm analysis of variance and variance component analysis of genotype-environment interactions. Analysis of 13 and 10 generations of data collected from the AC and ARB random-breds, respectively, indicated that the trait of primary concern (8-week body weight) remained stable, while significant regressions of population means on generations were observed for adult body weights and egg production. Selection under stress environments (low protein, thiouracil and FeCu deficiency) in quail resulted in the creation of genotype-environment interactions. Different genetic stocks were observed to differ in resistance to Rous Sarcoma virus challenge. Significant line by social environment interactions were observed with high mating line males

completing at least one mating in comparison to those from the low mating line, suggesting that both neural and endocrine influences are involved in mating behavior of chickens.

INVESTIGATOR: MARKS H L 7902-16110-005

LOCATION: USDA SE POULTRY RESEARCH LAB SMY: .0
ATHENS GEORGIA
START DATE: 23 10 73

EXPRESSION OF QUALITATIVE GENES OF POULTRY IN INTERNAL AND EXTERNAL ENVIRONMENTS

OBJECTIVES:
Determine the expression and physiological mechanisms of specific alleles in various genetic backgrounds and external environments; develop technological bases for application of specific alleles; maintain meat-type randombred populations.

INVESTIGATOR: GARWOOD V A 3302-16110-001

LOCATION: PURDUE UNIV SMY: .0
LAFAYETTE INDIANA
START DATE: 23 10 73

NATURE AND UTILIZATION OF GENETIC VARIATION OF ECONOMIC TRAITS IN CHICKENS

OBJECTIVES:
Determine causes of selection plateaus and selection limits; relationships of selection techniques social adaptability, and genotype environment interactions to efficiency of improvement in egg and meat production; methods of maintaining and using control populations. Evaluate relationship of chromosomes to production traits.

INVESTIGATOR: MARKS H L 7902-16110-002

LOCATION: USDA SE POULTRY RESEARCH LAB SMY: .2
ATHENS GEORGIA
START DATE: 03 02 69

INFLUENCE OF NUTRITION ON FERTILITY OF POULTRY UNDERGOING SELECTION FOR GROWTH RATE

OBJECTIVES:
Determine the influence of adverse nutritional environments on the fertility level of stocks selected for growth rate. Evaluate the influence of adverse environments on social aggressiveness.

PROGRESS REPORT: 72/07 73/06
Additional data on the influence of thiouracil on growth and fertility were collected. Utilizing the AC and ARB control populations, a thiouracil level of 0.08% fed continuously gave the same degree of restriction in body weight as 0.1% fed from 0-6 and 10-14 weeks. There was no interaction between dietary treatment and population for growth rate for these two populations. Fertility responses were not consistent for the two populations. The 0.1% thiouracil diet fed from 6-10 weeks did, however, result in the best overall fertility in both populations.

INVESTIGATOR: SMITH L W 1103-14740-003

LOCATION: AGRICULTURAL RESEARCH CENTER SMY: 1.1
BELTSVILLE MARYLAND

START DATE: 09 03 72

NUTRITIVE EVALUATIONS OF ANIMAL WASTES FOR LIVESTOCK FEED

OBJECTIVES:
Determine the nutritive value of livestock and poultry manures processed for feed.

PROGRESS REPORT: 72/07 73/06
Eight wethers were fed 4 rations of either I, 19; II, 38; III, 57; or IV, 100% dehydrated poultry manure (DPM). The remainder of rations I, II, and III was molasses, 10; solka floc, 15; and starch, 56, 37 and 18% of DM, respectively. Crude protein content and digestibility was: ration I, 6 and 10; II, 12 and 57; III, 18 and 58; and IV, 34 and 67, respectively. True digestibility of DPM crude protein was determined by regression and found to be 81%. This value is in the same range as those determined for mixed hay-concentrate rations fed to cattle. Lactating cows were fed for 90 days either a conventional concentrate (I) or a DPM-corn meal concentrate (II). Both concentrated contained 17% crude protein and were pelleted (4.77 mm dia). Ration II contained 32% DPM on a dry basis. Corn silage was offered ad libitum to obtain 10% refusal and alfalfa limited to 2.3 kg/cow/day. Cows fed II consumed less corn silage ($P<0.01$) and concentrate ($P<0.01$) dry matter, and produced less milk ($P<0.01$) than those fed I. Feed dry matter/fluid milk ratios for cows on I (0.873) and II (0.857) were not different ($P<0.05$), suggesting equal nutrient utilization for the two concentrates. Crude protein digestibility was 70.7 ± 3.4 for I, and 74.6 ± 3.2 (% and SD) for II when ascertained with weathers.

INVESTIGATOR: WILLSON G B 901-031-B603

LOCATION: UNIV OF MARYLAND SMY: 1.0
COLLEGE PARK MARYLAND

START DATE: 22 12 69

FARM ANIMAL WASTES MANAGEMENT

OBJECTIVES:
Develop methods and facilities for handling, reclaiming and/or disposing of farm animal wastes economically and without environmental pollution hazard or aesthetic nuisance.

PROGRESS REPORT: 72/07 73/06
Studies of the aerobic thermophilic compost process were continued. Cow feces combined with varying quantities of straw, sawdust, perlite and previously composted manure were composted in bench digestors. These tests indicate that the critical characteristic for initiation of the process is the internal structure of the mixture for its effect on air movement. Bulk density is useful as an indicator of the voids present. For a given bulking agent moisture content is useful indicator of the compostability. Stockpiling was evaluated for curing of partially composted dairy manure. Convective air movement supplied oxygen to a depth of at least 4 feet on the face of the stockpile. Moisture uptake from frequent rains did not have a noticable effect on air movement. Measurement of airflow resistance never exceeded 0.2 inches of water at the velocities used through 4 feet of composting manure. Process time did not appear to have an appreciable effect on airflow resistance. Several designs of water spray chambers were evaluated for removal of odors from ventilation air

exhausted from poultry houses. Although a reduction was noted, a distinct manure odor remained. Evaluated woodchips, sawdust, and shredded paper as bulking agents for composting raw and digested sewage sludge. Developed criteria for initial operations for the Beltsville project to compost sewage sludge from the Washington, D. C., Blue Plains sewage treatment plant.

INVESTIGATOR: CHILDS R E 7902-14980-002

LOCATION: RICHARD B RUSSELL AGR RES CENT SMY: .0
ATHENS GEORGIA
START DATE: 13 03 74

IMPROVED WASTE HANDLING METHODS IN COMMERCIAL POULTRY PROCESSING PLANTS

OBJECTIVES:
Develop improved methods of collecting, conveying and handling poultry processing wastes to abate pollution of air and water.

INVESTIGATOR: HAMM D SE6-6-2

LOCATION: RICHARD B RUSSELL AGR RES CENT SMY: 2.0
ATHENS GEORGIA
START DATE: 08 06 70

CHARACTERIZATION OF POULTRY PROCESSING EFFLUENTS AND USES FOR RECOVERED WASTES

OBJECTIVES:
Develop new and improved methods for recovery and use of inedible wastes and by products from poultry processing plants with subsequent reduction of waste water effluent pollution loads.

PROGRESS REPORT: 70/03 73/03
Waste effluents from seven processing steps in each of ten Southeastern poultry processing plants were analyzed for COD, total solids, non-volatile solids, volatile solids, Kjeldahl nitrogen, phosphorus, nitrate, and chloride. Great variation was observed between sampling times and between plants. Median values for COD and total solids were: From scalder, 2300 mg0(2)/1 and 1600 mg/1; from feather flume, 1900 mg0(2)/1 and 1000 mg/1; and from viscera flume, 1000 mg0(2)/1 and 500 mg/1. Data indicated potential and approaches to reduction in waste effluent loads. Type and amount of fat added to broiler rations appeared to influence the amount of fat in the effluent from the chiller. An 8% supplement of grease or poultry fat increased fat content of chiller water about 75%. Improved utilization of chicken blood in poultry rations has been effected through mild hydrolysis, and successful laboratory trials have been made for use of chicken blood in a dialdehyde starch-blood plywood glue. Since blood is an excellent source of lysine in animal diets, a study was made to define conditions of cooking and drying chicken blood that would optimize its lysine availability. Preliminary results indicate that the lysine availability is sensitive to some commercial drying procedures. A method for fluidizing freshly clotted chicken blood for use in pet food manufacture has been developed. Progress has been made on the evaluation of chicken proventriculus as a commercial source of pepsin for use in cheese manufacture.

INVESTIGATOR: EBY H J 1103-14740-001

LOCATION: AGRICULTURAL RESEARCH CENTER SMY: .8
BELTSVILLE MARYLAND
START DATE: 19 04 71

DEVELOPMENT OF MECHANIZED EQUIPMENT FOR THE PRODUCTION OF HOUSEFLY PUPAE

OBJECTIVES:
Develop system components and complete systems for collection of livestock wastes, placement in suitable containers, inoculation with measured quantity of housefly eggs, incubation, collection and processing the resultant housefly pupae for livestock protein feed supplement.

PROGRESS REPORT: 72/07 73/06
A mechanical unit was completed and partially tested, i.e.; the component parts were all functional but more testing was desired before the design load of 2 tons of manure was placed in the culturing tank. During this period several design improvements were needed, such as: a polyethylene endless screen belt instead of the galvanized wire screen used initially; a counter-rotating nylon brush placed at the discharge end of the belt to clean off any adhering residue; and a repositioning of the belt to give the collecting pans a greater pitch to aid in collecting the separated larvae. This was necessary for two reasons: 1) The original pitch was too low, and 2) the larvae were going through the screen before the perforated screen separated from the solid drive belt and were dropping off the solid belt as it went around the return roller. Repositioning the belt allowed us to put an additional pan under the solid belt. Modifications are complete except for the installation of the new belt. The installation of a conveyor for the removal of the spent culture media has also been completed. The unit will produce 22 kg dry pupae/182 kg dry poultry/5 days operation as a batch process. Design allows for continuous operation.

INVESTIGATOR: ROGOFF W M 5202-14410-001

LOCATION: USDA 5578 AIR TERMINAL DRIVE SMY: 1.8
FRESNO CALIFORNIA
START DATE: 03 04 69

BIOLOGY AND CONTROL OF MOSQUITOES IN IRRIGATED AND WATER MANAGEMENT AREAS

OBJECTIVES:
Determine biology and habits of mosquitoes associated with irrigated areas; investigate water-management procedures in relation to mosquito abundance and control. Develop chemical, non-chemical, and integrated control methods and materials for irrigation produced mosquitoes.

PROGRESS REPORT: 72/07 73/06
Emphasis has been on biological and physical, rather than chemical methods of control. A nematode parasite, Reesimermis nielseni, reared at a four-fold expansion of previous rearing efforts, was distributed in irrigated pastures primarily for control of A. nigromaculis. Results were highly variable, with a maximum infection rate of 57% (but long term effects are not yet known). A limitation to the use of fish for mosquito control is an adequate supply at the proper time, therefore a pilot fish culture system was constructed to improve current procedures available for mosquito fish supply. An automatic chemosterilizing mosquito trap was designed and built and was shown to sterilize over 90% of the mosquitoes passing through it in a two-month period. Laboratory, field test plot and preliminary pasture tests on a virus imported from Louisiana were made with moderate success. A new type hole borer was developed for vertical drainage of temporary mosquito breeding pools on irrigated land. It was shown that the addition of grids that subdivide surface areas in steel cemetery vases would prevent egg deposition by C. p.

quinquefasciatus. After 2 1/2 years in continuous test in simulated treeholes, the insecticides Abate, chlorpyrifos, and fenthion continued to be 100% effective at dosages of 50 holes or more per pound of toxicant.

INVESTIGATOR: ROGOFF W M 5202-15490-002

LOCATION: USDA 5578 AIR TERMINAL DRIVE SMY: 1.3
FRESNO CALIFORNIA
START DATE: 03 04 69

BIOLOGY AND CONTROL OF FLIES AFFECTING LIVESTOCK IN WESTERN U.S.

OBJECTIVES:
Find economical, effective, and practical means of controlling flies affecting livestock.

PROGRESS REPORT: 72/07 73/06
Field and laboratory investigations into the possible role of arthropods in the transmission of Exotic Newcastle Disease (VVND) of poultry in southern California were initiated during the emergency in FY 1973. Of the insects collected from infected premises only Fannia canicularis and F. femoralis have yielded the virus. Successful laboratory transmissions were accomplished with laboratory-reared F. canicularis exposed to suspensions of VVND virus. Electron microscopy is being employed to study the fate of the virus in exposed flies. Laboratory experiments have shown rubidium chloride to be a useful fly marker for planned studies of fly movement from depopulated poultry ranches. A presumed insecticide resistant colony of F. canicularis from the Napa Valley was established for evaluation in the laboratory.

INVESTIGATOR: DRUMMOND R O 7305-15490-002

LOCATION: USDA LIVESTOCK INSECT LAB SMY: 2.6
KERRVILLE TEXAS
START DATE: 04 05 66

BIOLOGY AND CONTROL OF FLIES AFFECTING LIVESTOCK AND POULTRY IN THE SOUTHWEST

OBJECTIVES:
Identify and evaluate repellents, attractants, insecticides, sterility and biological agents for control of the horn fly, stable fly, and fleeceworms, and flies affecting poultry; determine new approaches and integrated techniques to control these insects under southwestern conditions.

PROGRESS REPORT: 72/07 73/06
In spot tests, 4 compounds were Class IV toxicants and 2 synthetic pyrethrums were Class IV repellents at 0.5%. Cooper 11270 and ethion were tested by the large-cage technique. Three juvenile hormone analogs (insect growth-regulating materials) inhibited development of stable flies and horn flies in the feces of cattle treated orally; Zoecon ZR-515 was effective as low as 150 mg/cow per day for stable flies and 1 mg for horn flies. In a field study, a fog generator applied insecticide mists to cattle; naled was effective for 2-3 days and chlorpyrifos for 3-4 days. Very little toxicant reached the cattle. Of materials incorporated into larval medium to mark horn flies, MnCl(2)-4H(2)O improved growth and survival; none permanently marked adults. With the steer colony technique, > 40,000 pupae/day were produced. An automatic device for collecting eggs from caged horn flies was successful. In the laboratory colony, reproduction of horn flies in smaller cages was greater than that of flies in larger cages. Treating horn flies with 1250 rad from ^{137}Cs did not affect mating competitiveness but did sterilize adults. Sterile horn flies were

released on a herd of cattle over 16 weeks; 49% of the flies on the herd were released flies and 20% of the wild females laid sterile eggs. Plans were made for an experiment to eradicate horn flies with insecticides and sterile males during FY 1974 and FY 1975 in Hawaii.

INVESTIGATOR: MORGAN N O 1103-15490-001

LOCATION: AGRICULTURAL RESEARCH CENTER SMY: 1.4
BELTSVILLE MARYLAND
START DATE: 21 12 65

PHYSICAL MEANS OF FLY CONTROL

OBJECTIVES:
Investigate the various potential physical means of fly control including sound, light, temperature, and electromagnetic forces. Design and evaluate various traps and mechanical devices for fly control relative to livestock. Explore potential use of insects as agents for agricultural pollution control.

PROGRESS REPORT: 72/07 73/06
A solid bait for flies was developed, an improvement over previous baits by increasing shelf life, increasing insect attraction while reducing odors obnoxious to humans. New methods for rapidly evaluating lamps as fly attractants and predicting fly responses was developed. A Pteromalid wasp, Pachycrepoideus vindemmiae (Rodani) has been colonized in the laboratory and is an effective parasite of dipterous pupae. It will be studied for effect on fly populations in barns. Musca autumnalis DeGeer pupae and adults are being exposed to gamma irradiation to develop a sterile male method of fly control. Ultra-low-volume applications of insecticides are being tested, equipment designed and aerial applications studied for controlling flies in strategic situations, i.e., dairy barns, milking rooms, and areas where insects may be vectors of epidemic diseases of man and animals. Insecticides of low mammalian toxicity, LD(50) >4000 mg/kg body wt, and with short residual BODY WT, AND WITH SHORT RESIDUAL activity, < 48 hr, are tested. The current epidemic diseases transmitted by target flies include hog cholera virus of swine and Newcastles disease of poultry. A method for testing ULV insecticides in barns has been standardized. Aspirators have been developed for collecting live flies exposed to diseased livestock. Such flies are analyzed at the Virology Section, NADL, Ames.

INVESTIGATOR: WEIDHAAS D E 7602-15490-001

LOCATION: UNIV OF FLORIDA SMY: 6.3
GAINESVILLE FLORIDA
START DATE: 27 05 66

BIOLOGY AND CONTROL OF FLIES OF THE SOUTHEAST

OBJECTIVES:
Develop biological, chemical, and integrated control procedures for house flies, stable flies, and tabanids of the southeast.

PROGRESS REPORT: 72/07 73/06
No new compounds that were highly effective against house flies resistant to all-known types of insecticides were found in spite of the fact that many compounds were effective against susceptible strains of house flies. One hormonal-type compound was effective in inhibiting development of house fly larvae and several caused sterility. Several pyrethroid-type compounds were shown to be highly effective against resistant strains of house flies. Field tests utilizing ground ultralow volume application techniques have shown that pyrethroids with synergists are highly effective in house fly control. No new

compounds highly effective against resistant strains of mosquitoes or house flies were developed. Promising and effective insecticides were shown to be effective as residual treatments in spite of the fact that they possessed an irritant effect. Seasonal abundance of house flies on a yearly cycle was compared with special laborabory studies on the egg production of live females throughout their life to develop estimates of the dynamics of house fly populations. Rates of increase typical of house fly populations and the fecundity of females show that survival in immature stages and adult forms is relatively low. Further studies with muscalure confirm that equal numbers of males and females respond to baits in the field and showed that 4% to 14% of marked, released flies could be recaptured.

GPO 878-644